FIG. 1a

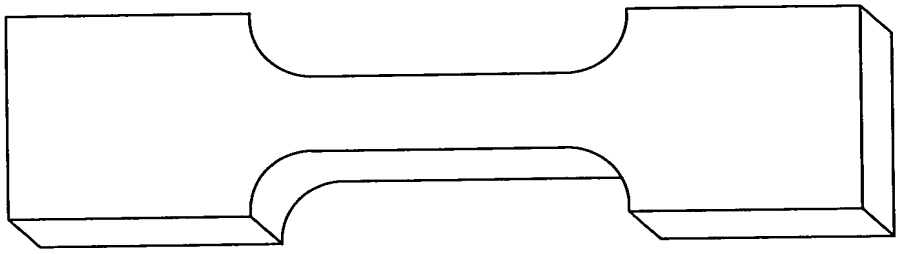


FIG. 1b

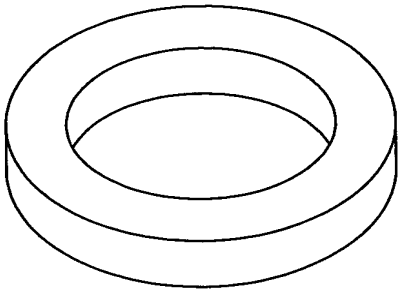


FIG. 2

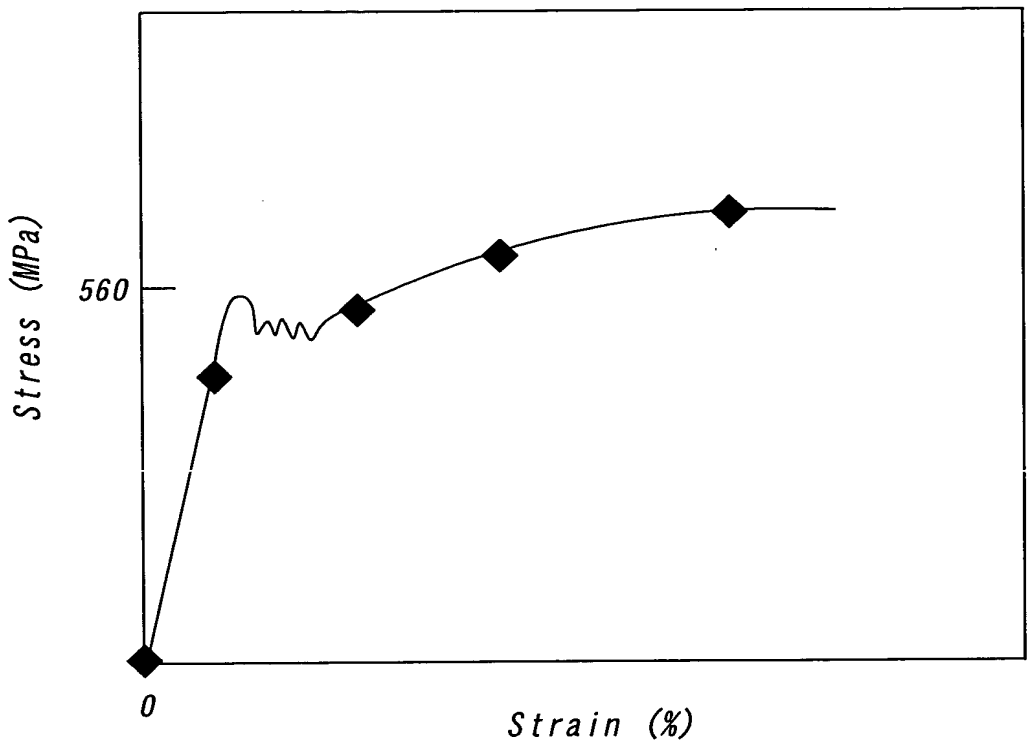


FIG. 3

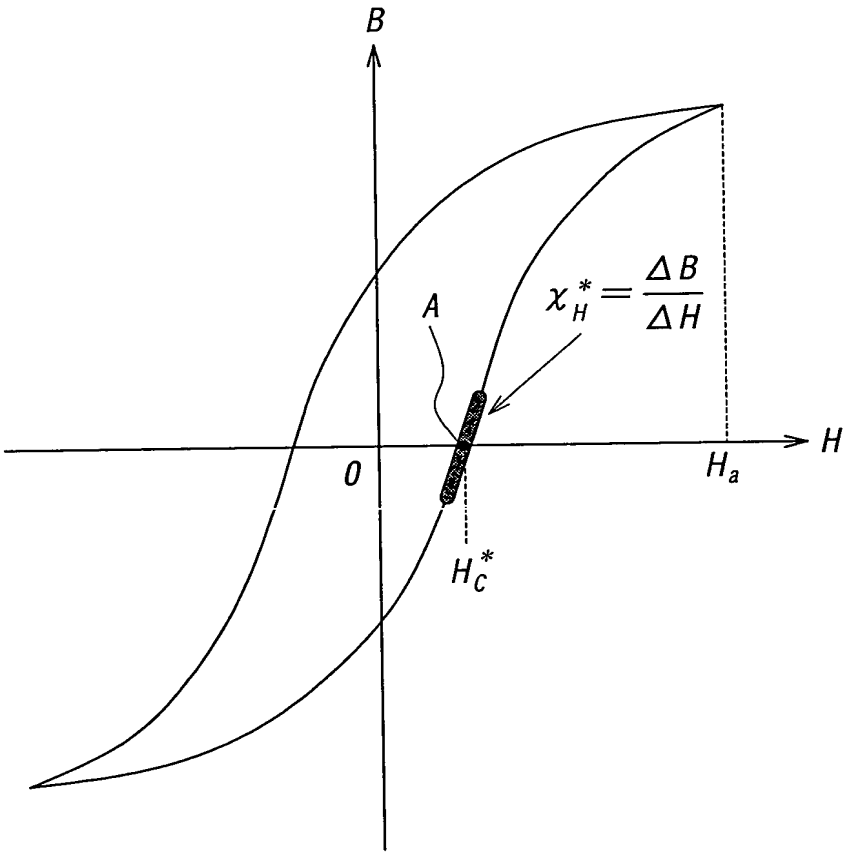


FIG. 4

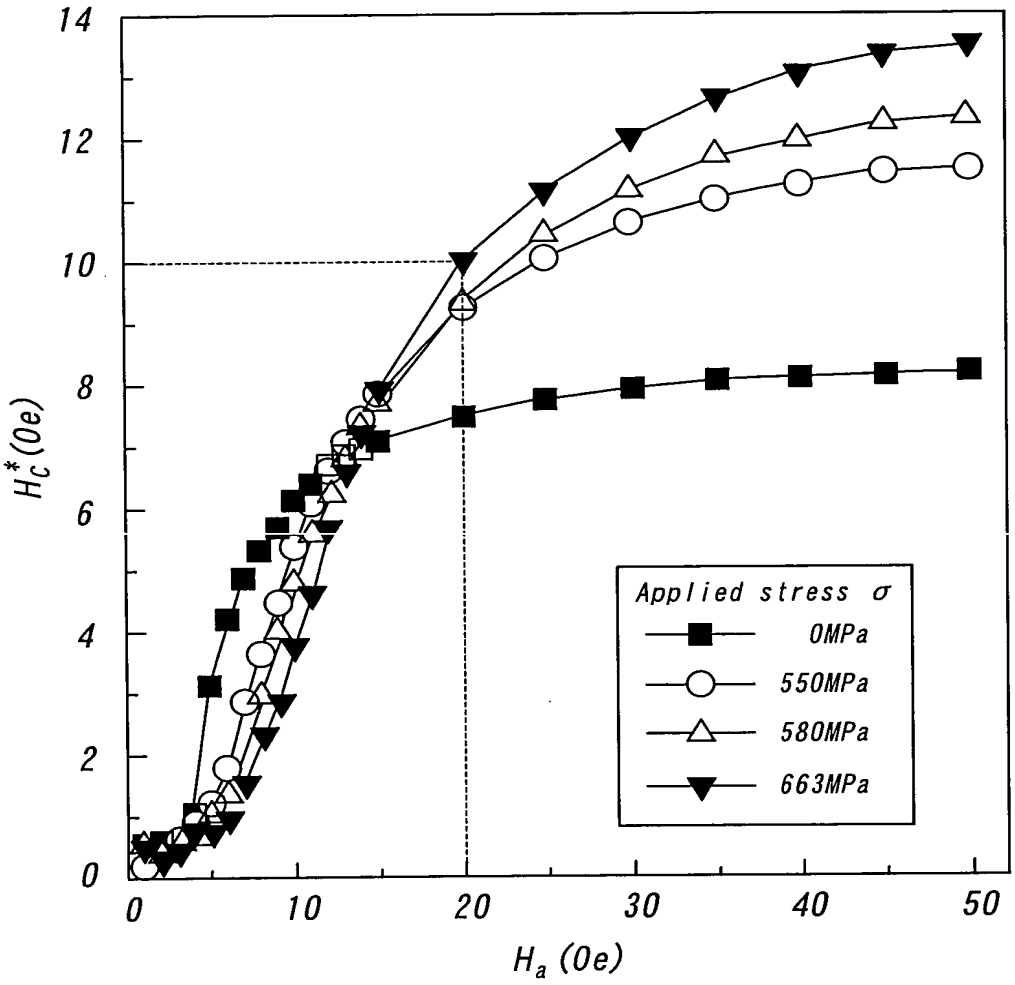

14
12
10
8
6
4
2
0
0
10
20
30
40
50
H_c^* (Oe)
H_a (Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 5

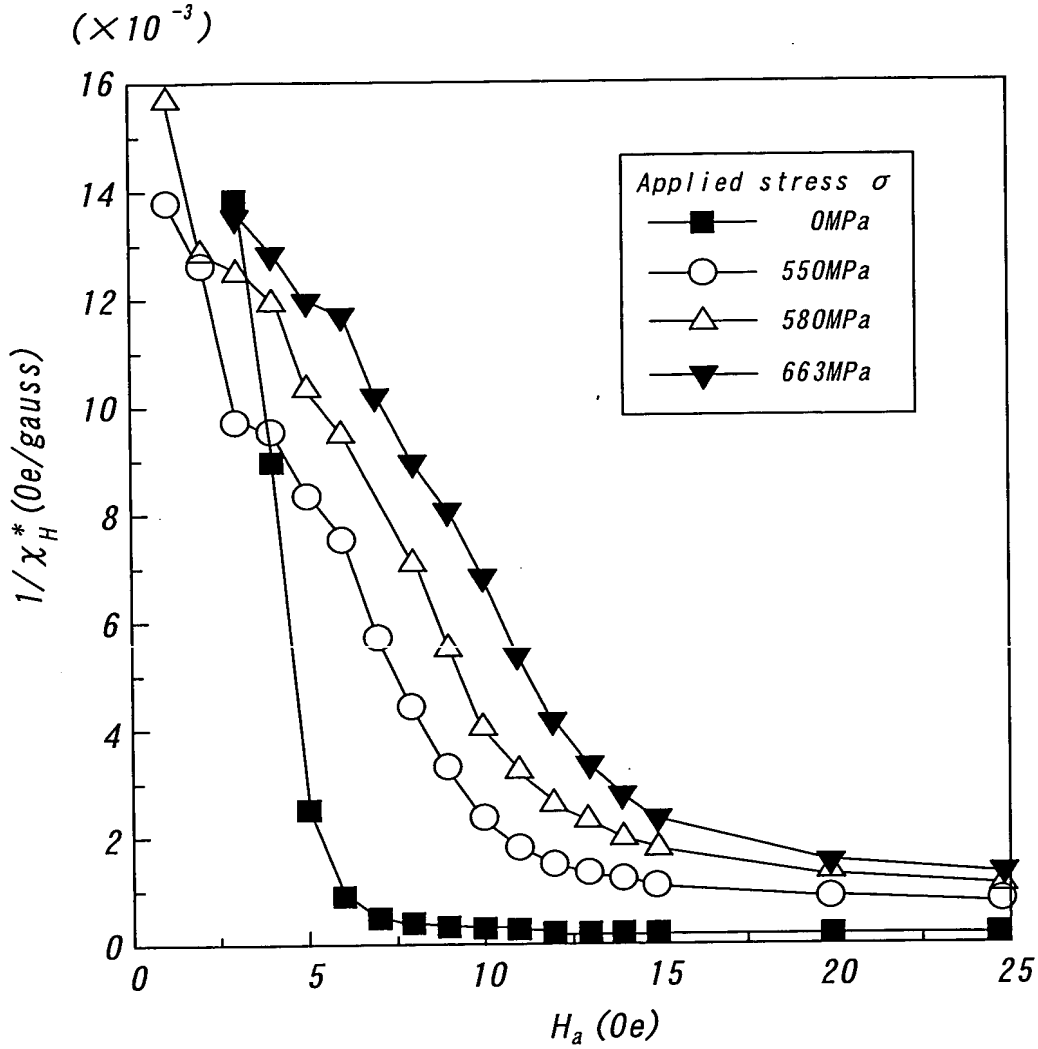

(×10⁻³)
16
14
12
10
8
6
4
2
0
1/χ*H (Oe/gauss)
0
5
10
15
20
25
Ha (Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 6

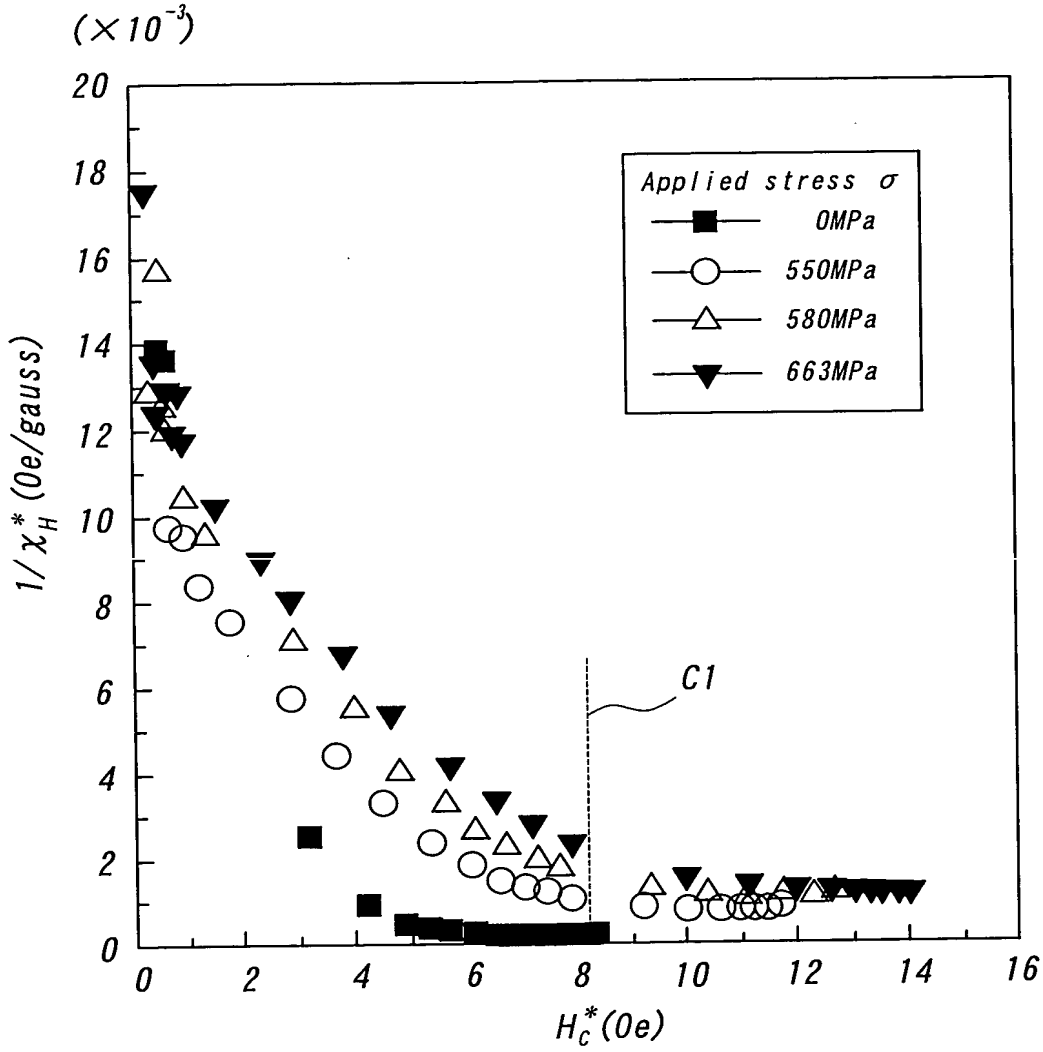

(×10⁻³)
20
18
16
14
12
10
8
6
4
2
0
1/χ*H (Oe/gauss)
0
2
4
6
8
10
12
14
16
H*c (Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa
C1

FIG. 7

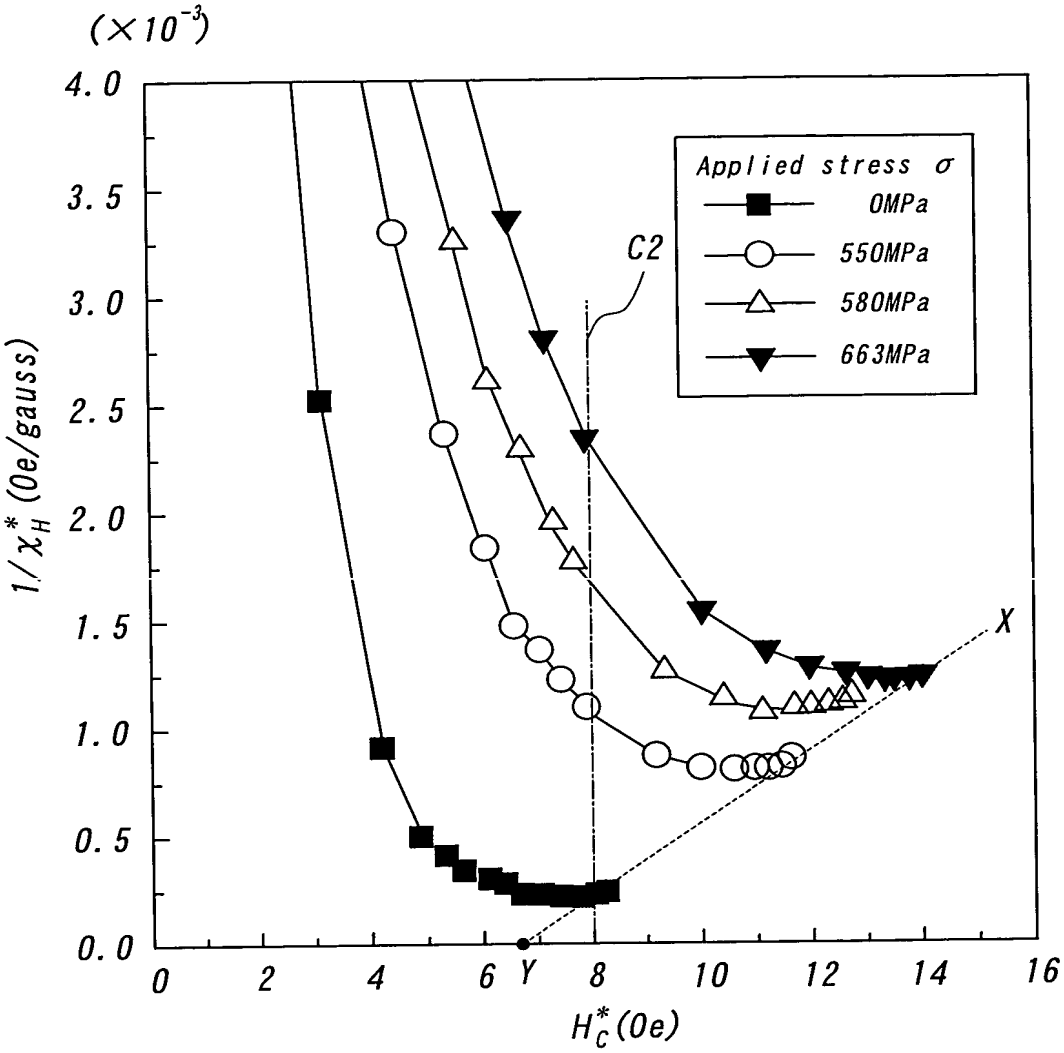

(×10⁻³)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/χ*H (Oe/gauss)
0
2
4
6
Y
8
10
12
14
16
H*C (Oe)
C2
X
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 8

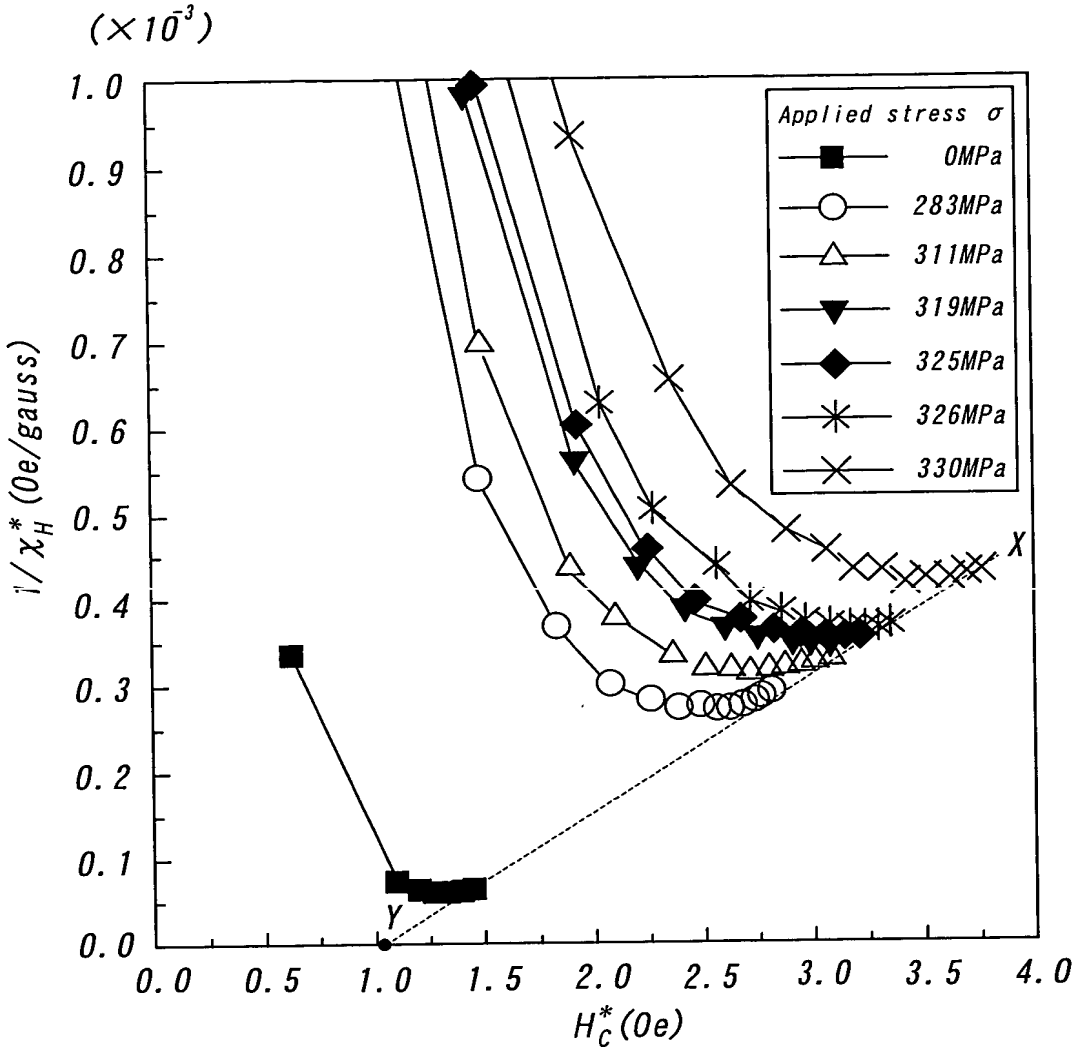

(×10⁻³)
1/χ*H (Oe/gauss)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
H*C (Oe)
Applied stress σ
0MPa
283MPa
311MPa
319MPa
325MPa
326MPa
330MPa
X
Y

FIG. 9

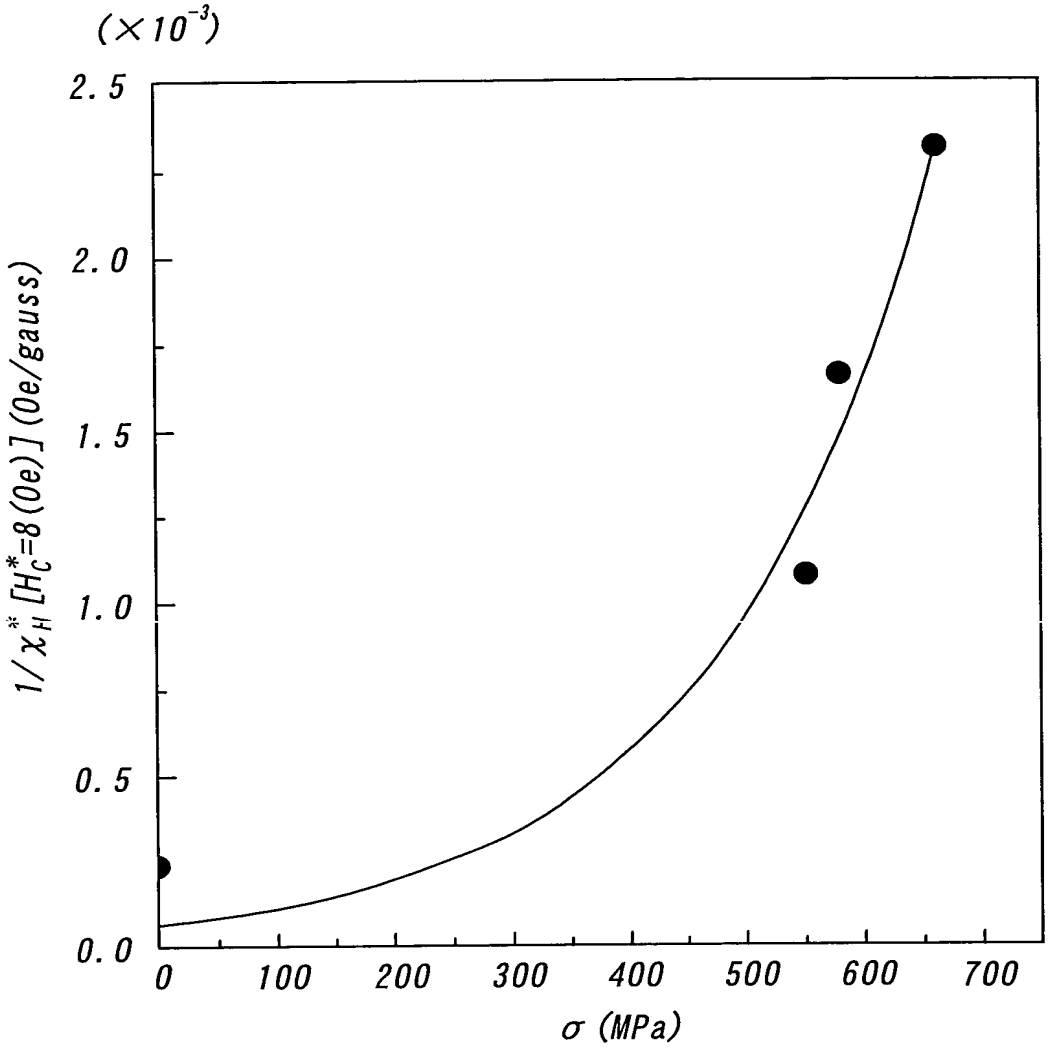

(×10^-3)
2.5
2.0
1.5
1.0
0.5
0.0
1/χ*H [H*c=8 (Oe)] (Oe/gauss)
0
100
200
300
400
500
600
700
σ (MPa)

FIG. 10

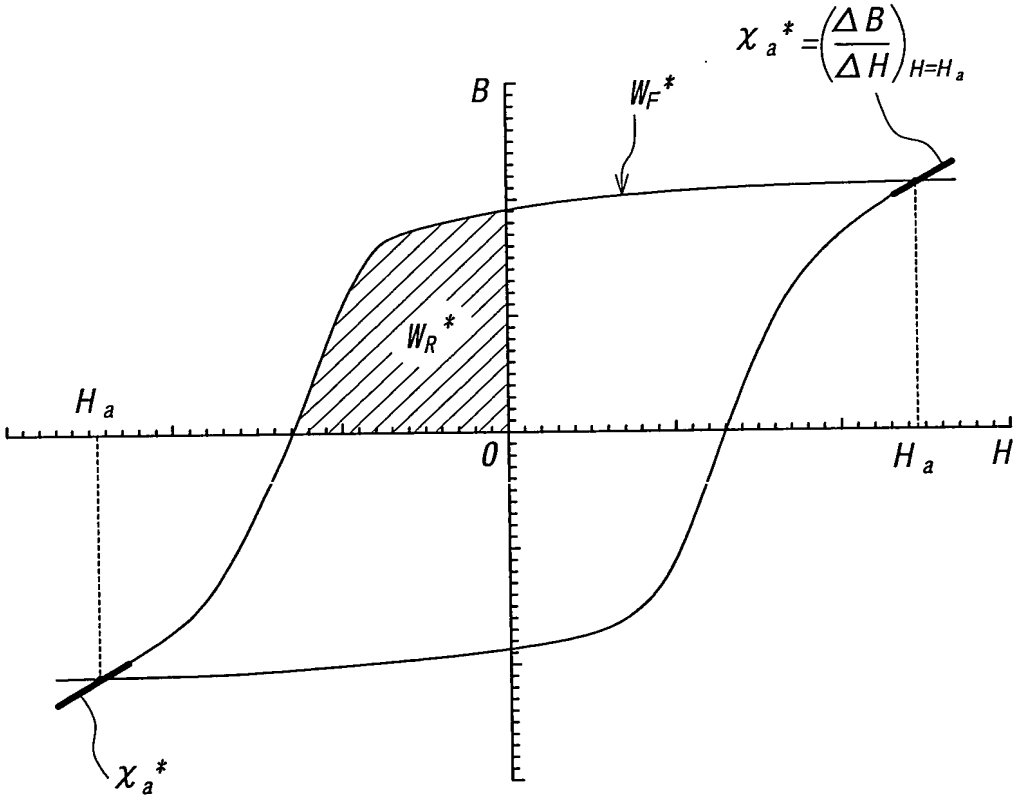


FIG. 11

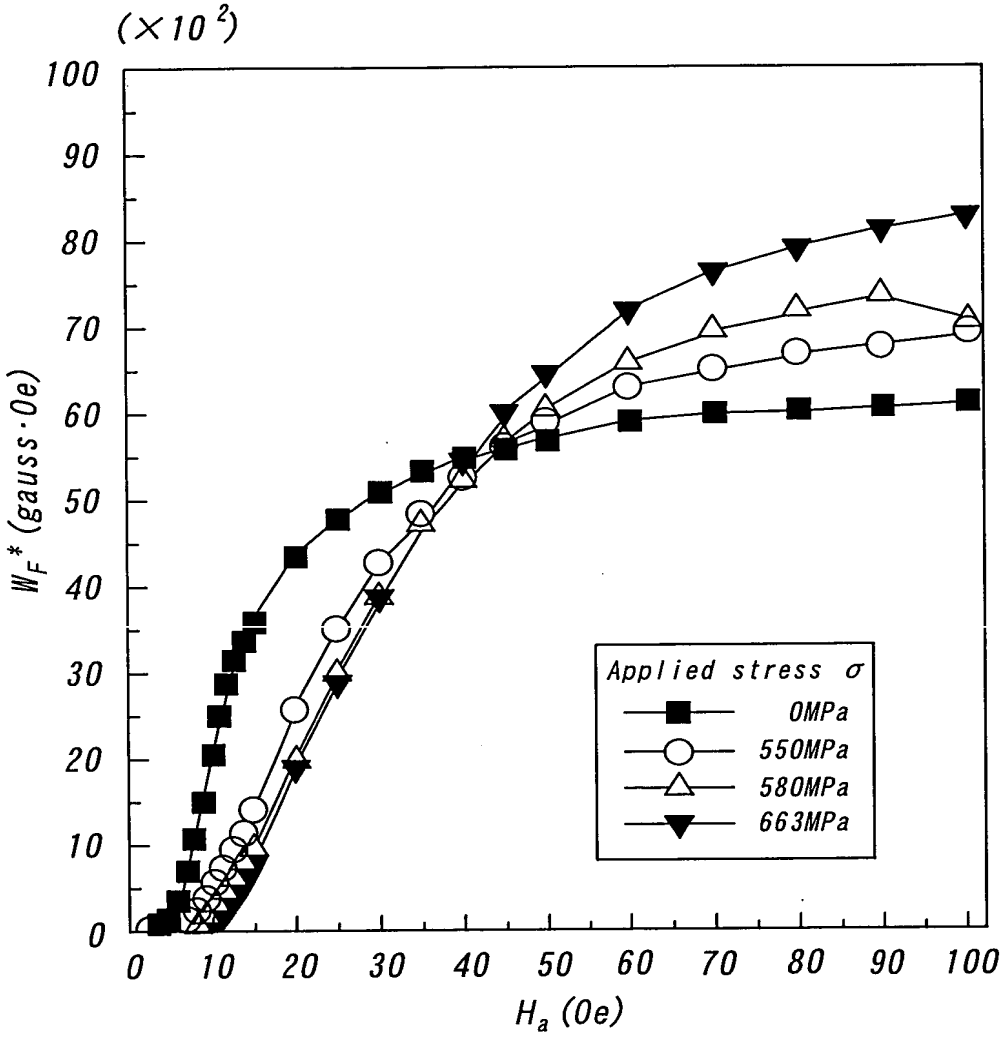

(×10²)
100
90
80
70
60
50
40
30
20
10
0
W_F* (gauss·Oe)
0
10
20
30
40
50
60
70
80
90
100
H_a (Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 12

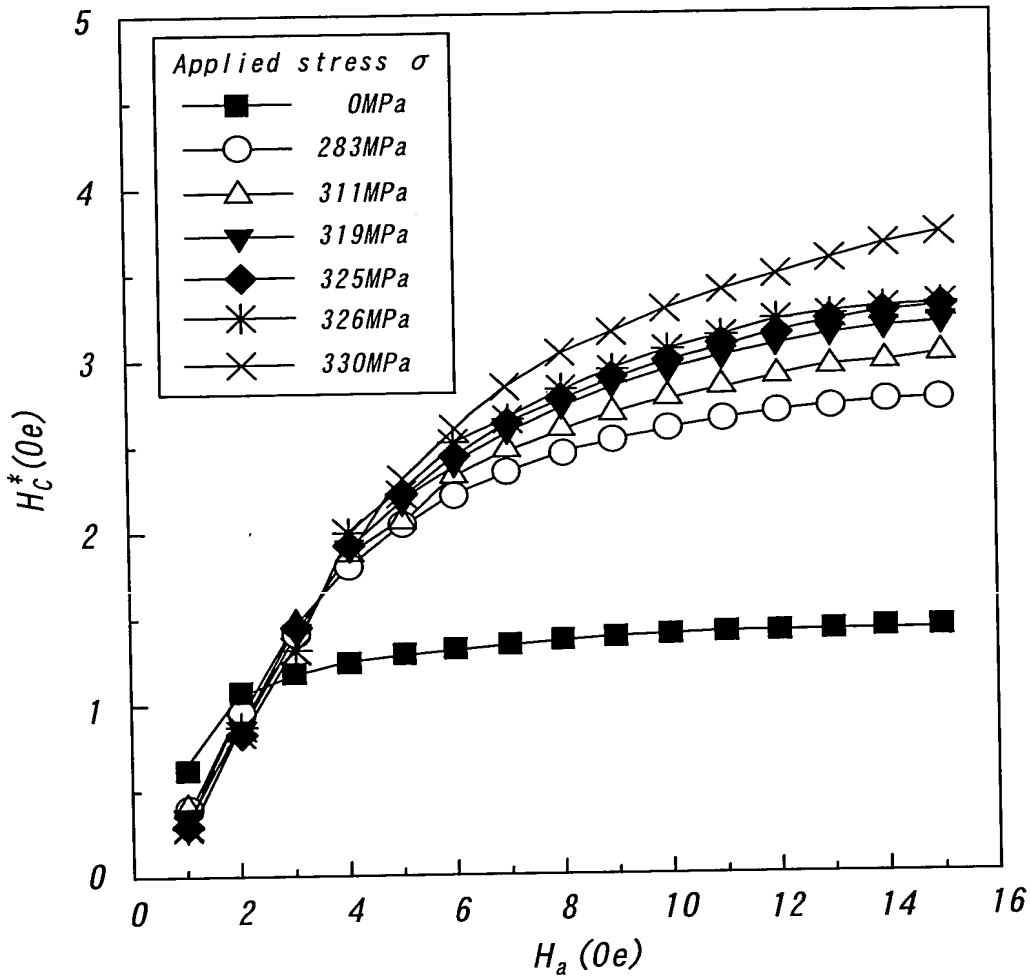

Applied stress σ
0MPa
283MPa
311MPa
319MPa
325MPa
326MPa
330MPa
H_c^* (Oe)
H_a (Oe)
0
1
2
3
4
5
0
2
4
6
8
10
12
14
16

FIG. 13

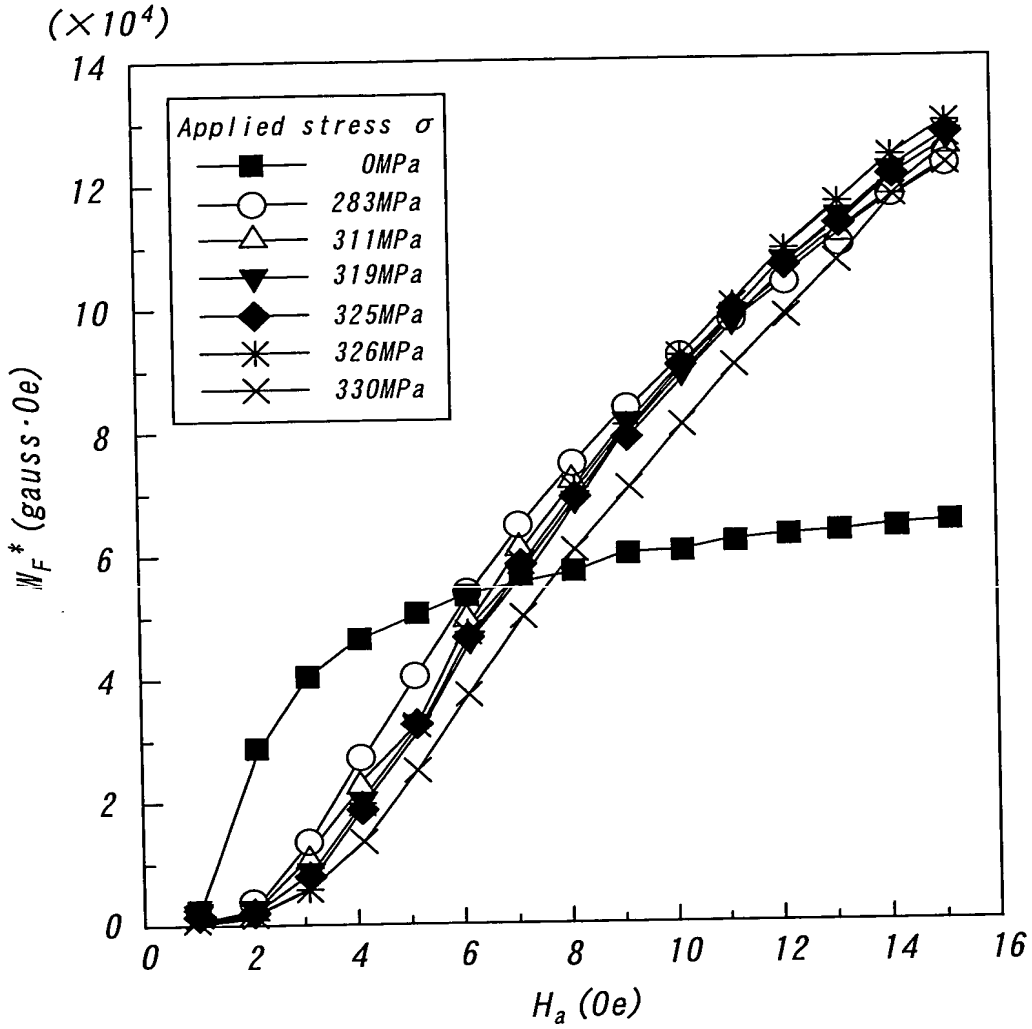

(×10⁴)
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
W_F^* (gauss·Oe)
H_a (Oe)
Applied stress σ
0MPa
283MPa
311MPa
319MPa
325MPa
326MPa
330MPa

FIG. 14

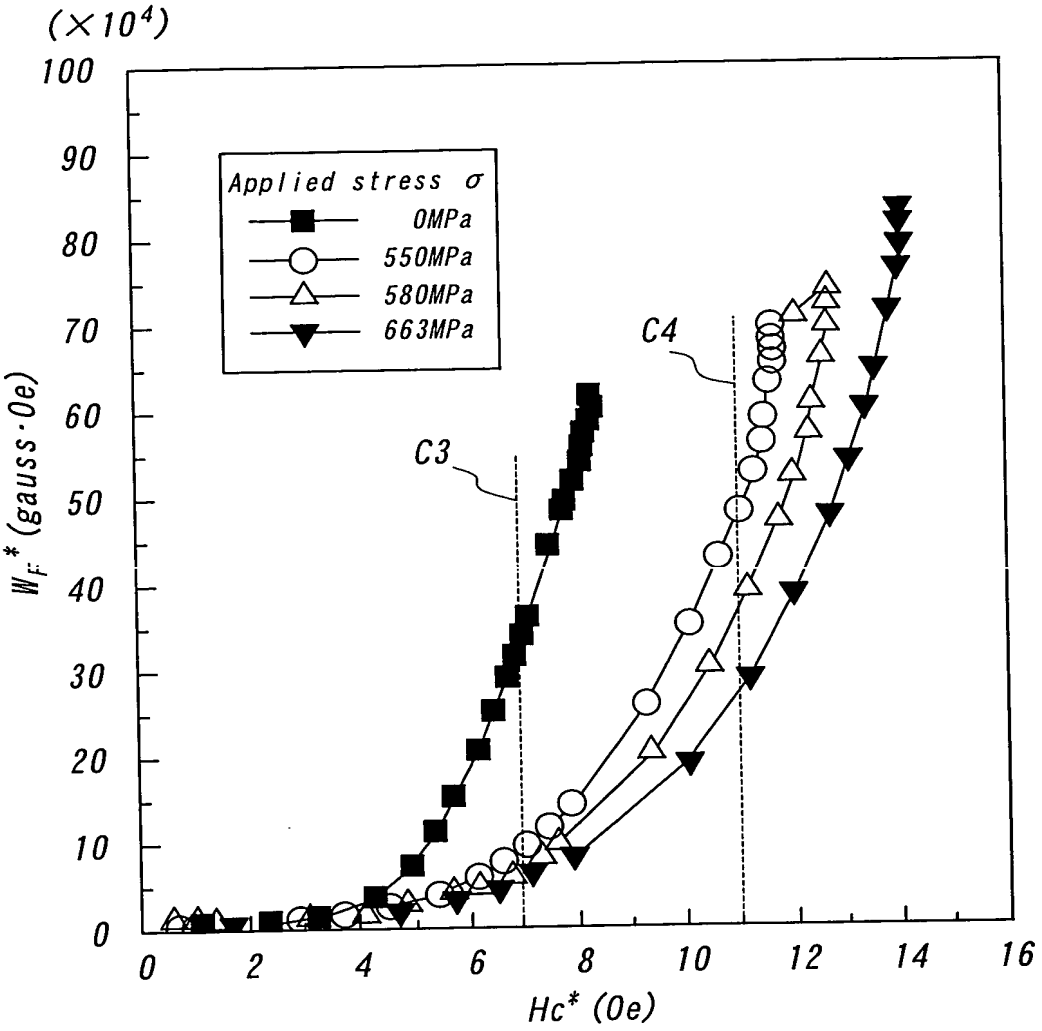

(×10⁴)
100
90
80
70
60
50
40
30
20
10
0
W_F^* (gauss·Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa
C3
C4
0
2
4
6
8
10
12
14
16
Hc* (Oe)

FIG. 15

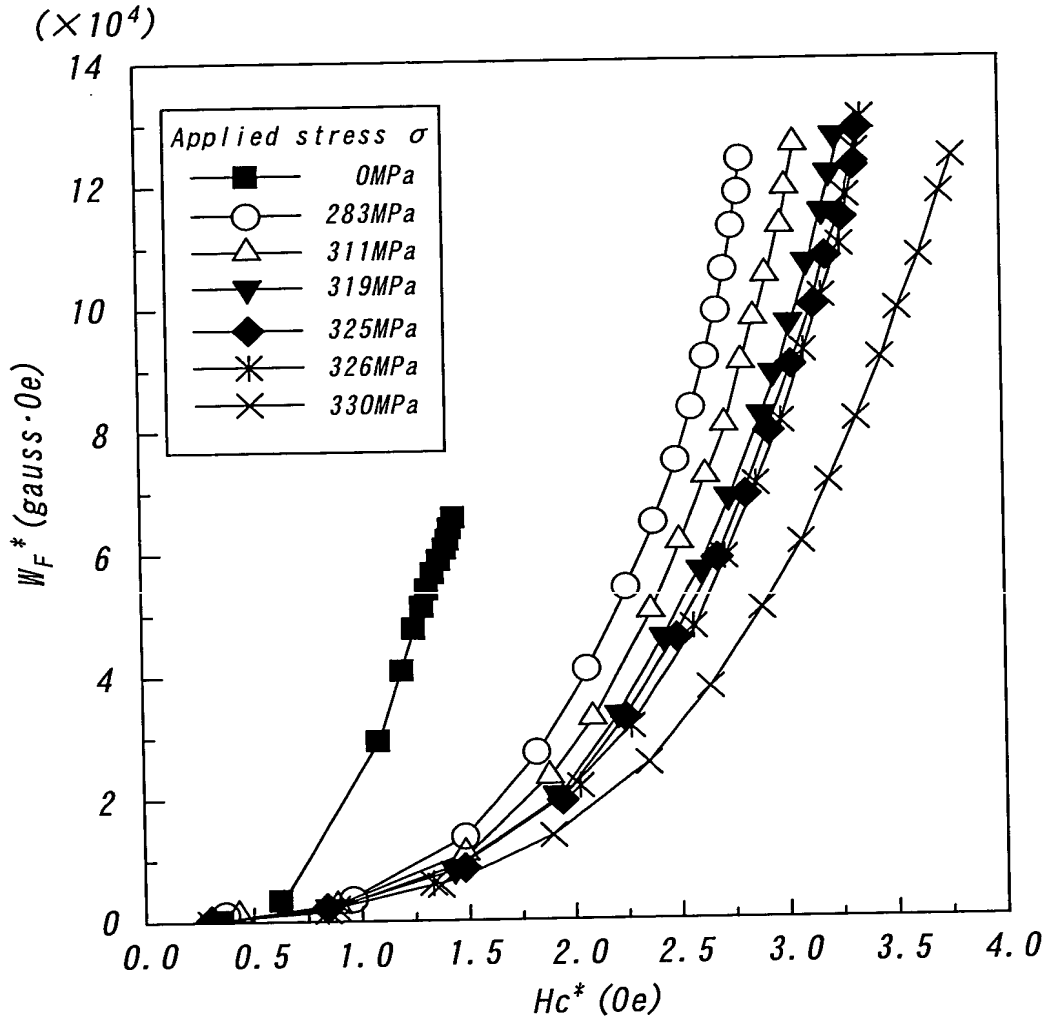

(×10⁴)
14
12
10
8
6
4
2
0
W_F^* (gauss·Oe)
Applied stress σ
0MPa
283MPa
311MPa
319MPa
325MPa
326MPa
330MPa
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Hc* (Oe)

FIG. 16

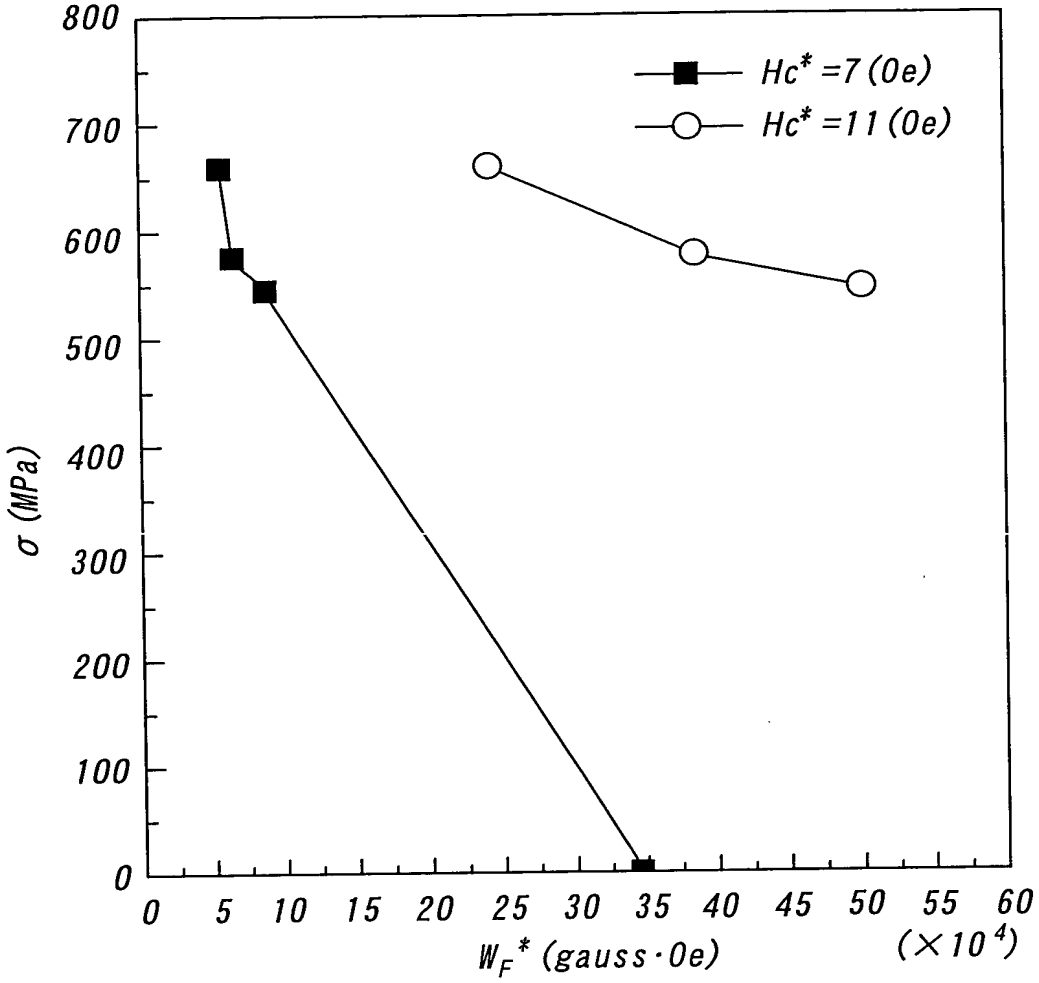

800
700
600
500
400
300
200
100
0
σ (MPa)
Hc* =7 (Oe)
Hc* =11 (Oe)
0 5 10 15 20 25 30 35 40 45 50 55 60
W_F^* (gauss·Oe)
(×10⁴)

FIG. 17

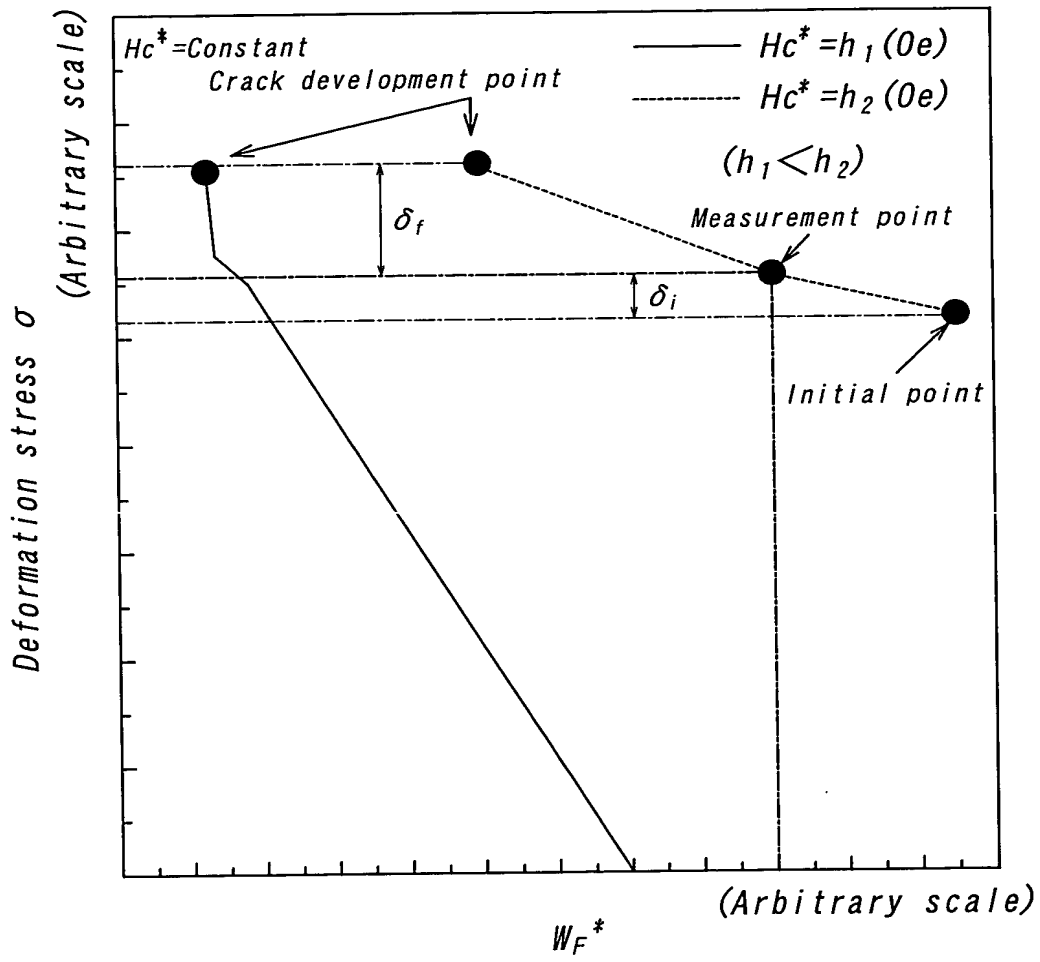

Hc*=Constant
Crack development point
Hc* =h1 (Oe)
Hc* =h2 (Oe)
(h1<h2)
δf
Measurement point
δi
Initial point
Deformation stress σ
(Arbitrary scale)
(Arbitrary scale)
WF*

FIG. 18

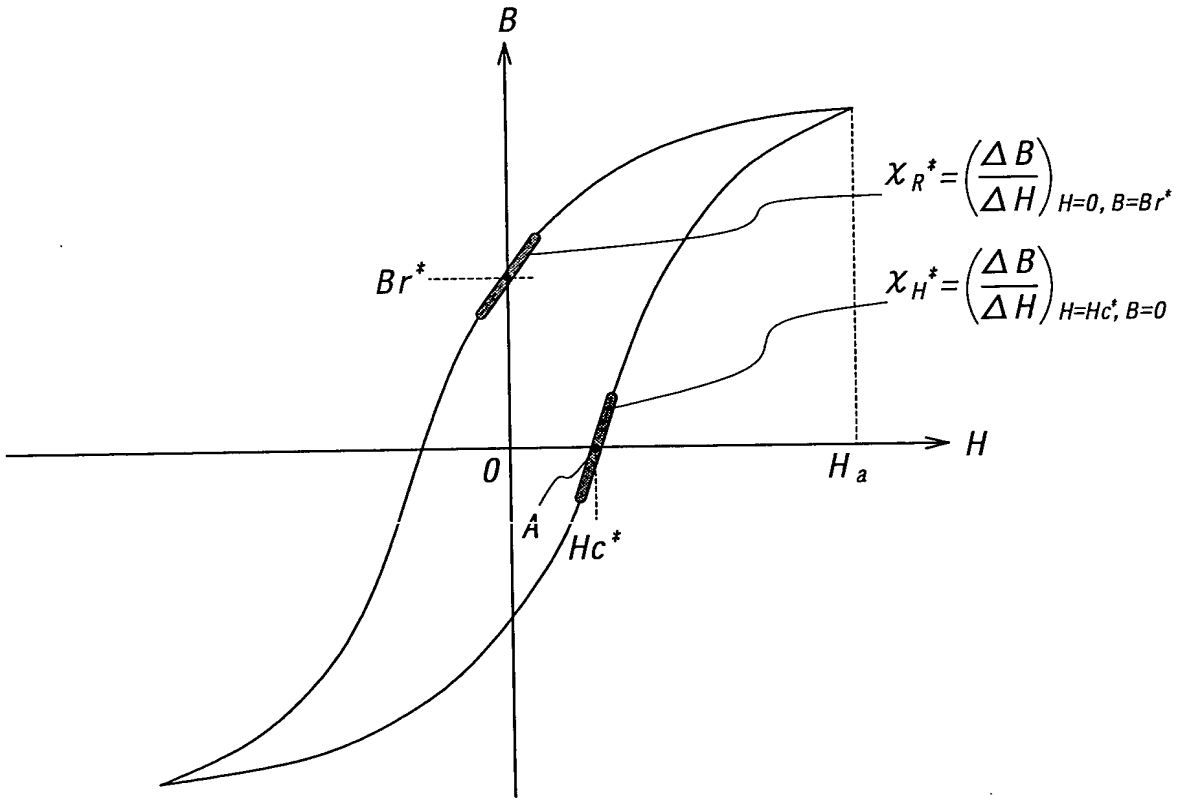

B
H
0
Br*
Ha
A
Hc*
$\chi_R^* = \left(\frac{\Delta B}{\Delta H}\right)_{H=0,\ B=Br^*}$
$\chi_H^* = \left(\frac{\Delta B}{\Delta H}\right)_{H=Hc^*,\ B=0}$

FIG. 19

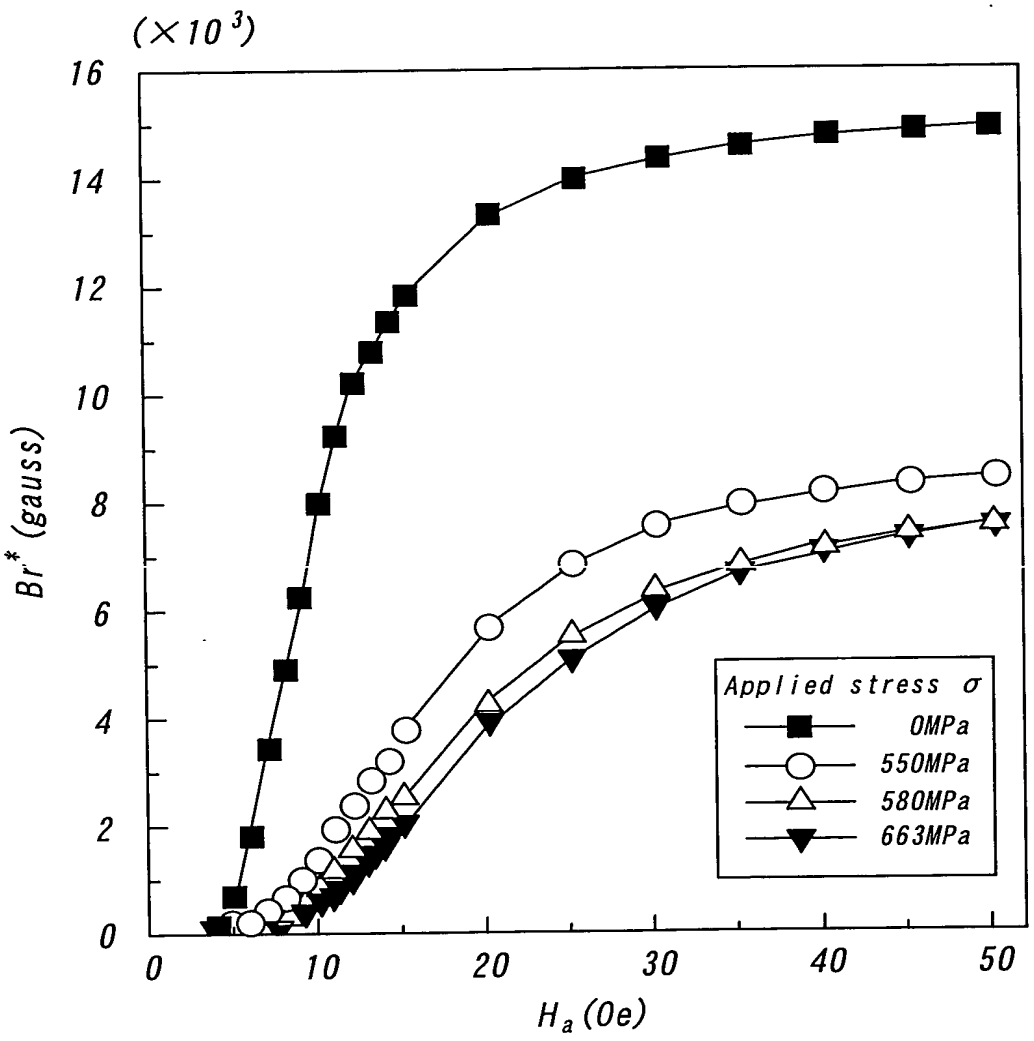

(×10³)
16
14
12
10
8
6
4
2
0
Br* (gauss)
0
10
20
30
40
50
Ha (Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 20

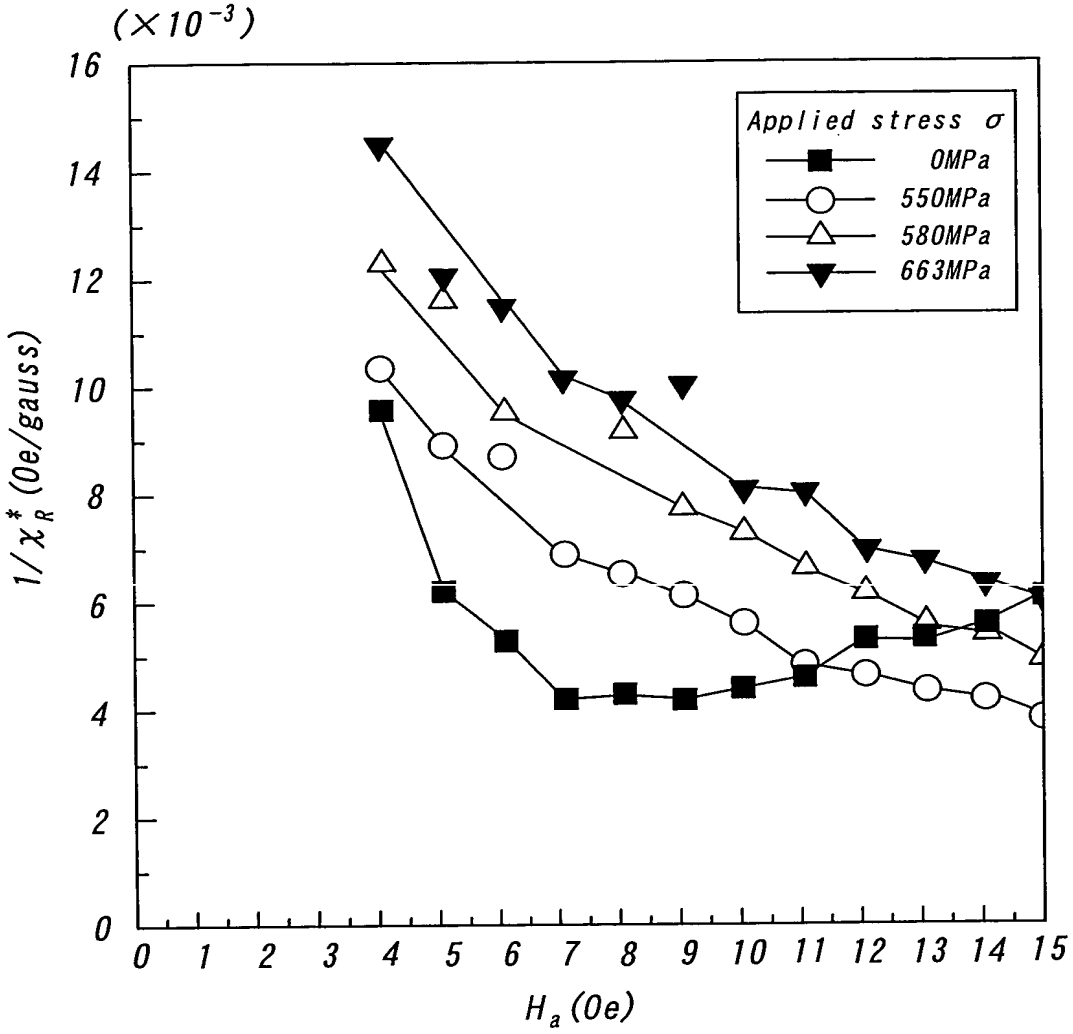

(×10⁻³)
16
14
12
10
8
6
4
2
0
1/χ*R (Oe/gauss)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Ha (Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 21

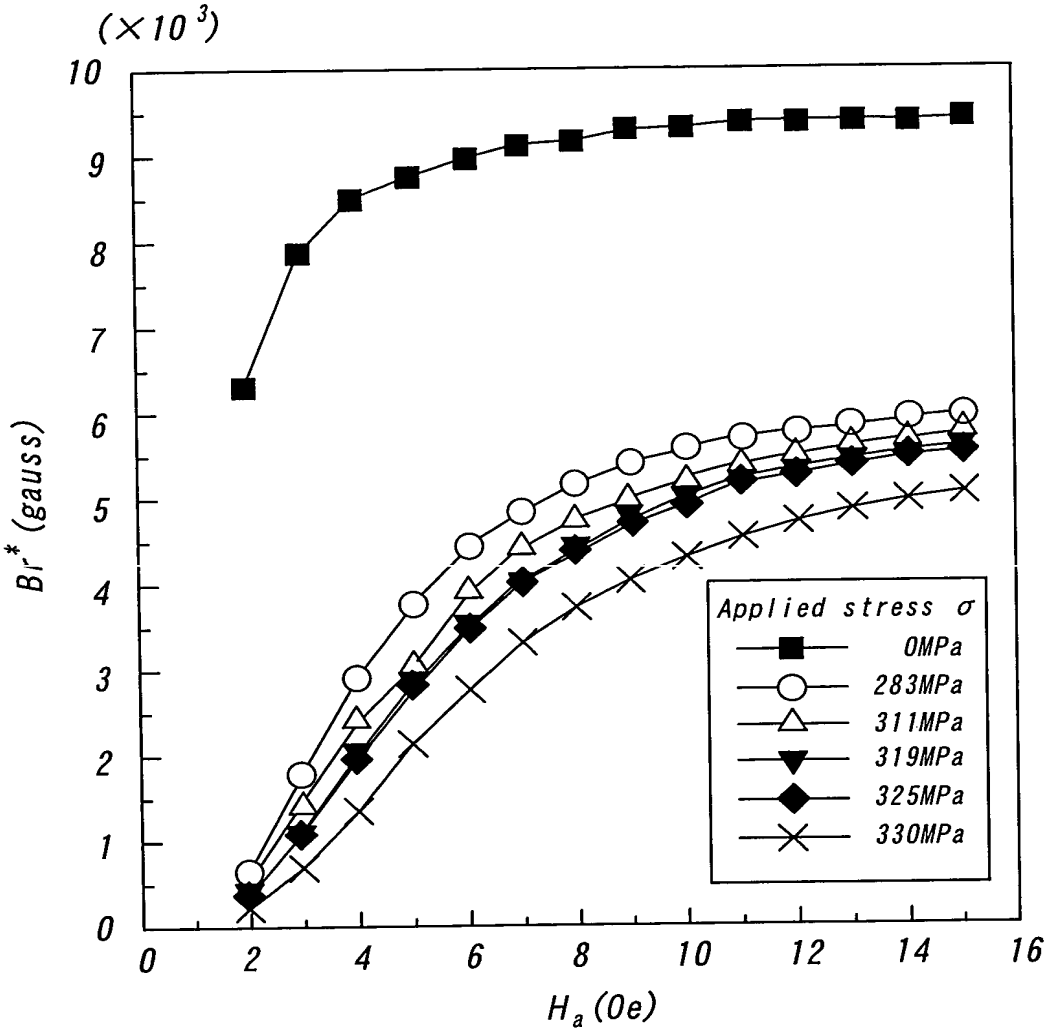

(×10 3)
10
9
8
7
6
5
4
3
2
1
0
Br* (gauss)
0
2
4
6
8
10
12
14
16
Ha (Oe)
Applied stress σ
0MPa
283MPa
311MPa
319MPa
325MPa
330MPa

FIG. 22

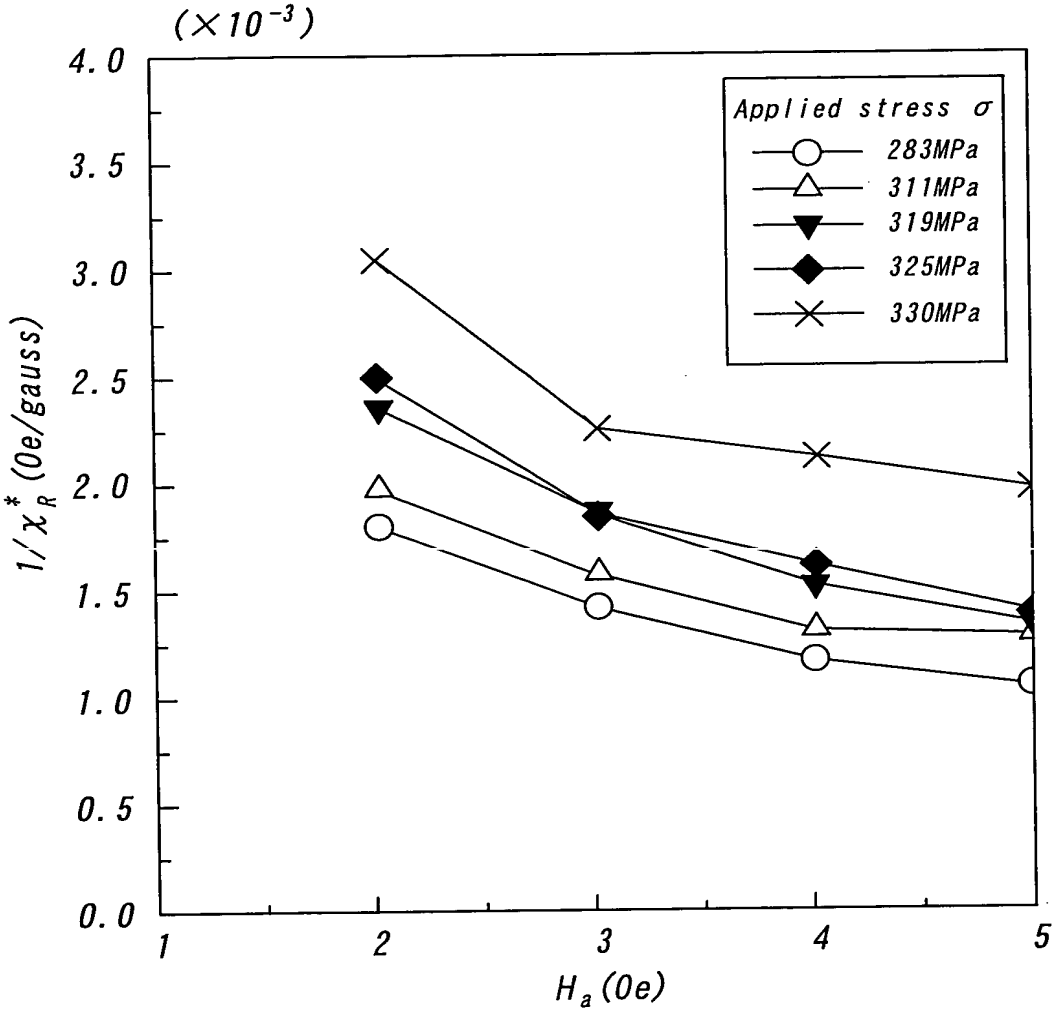

(×10⁻³)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/χ*R (Oe/gauss)
1
2
3
4
5
Ha (Oe)
Applied stress σ
283MPa
311MPa
319MPa
325MPa
330MPa

FIG. 23

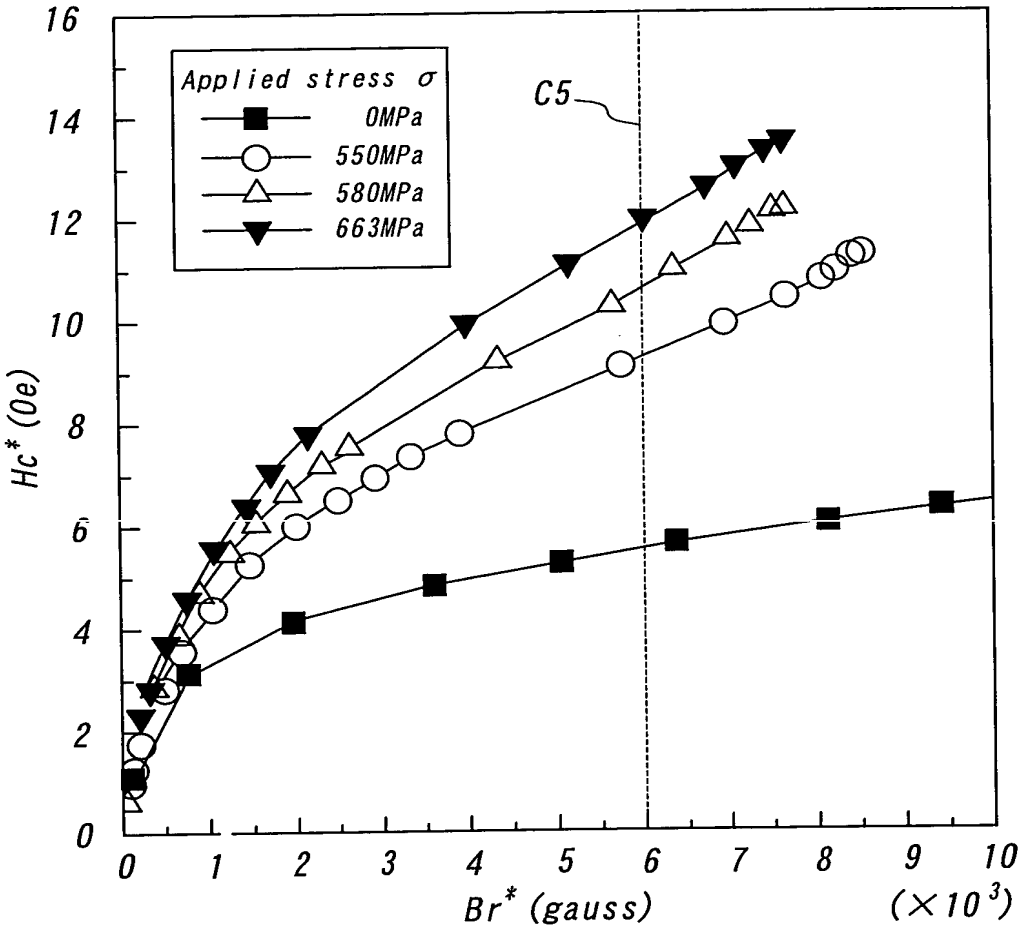

Applied stress σ
0MPa
550MPa
580MPa
663MPa
C5
Hc* (Oe)
Br* (gauss)
(×10³)
0
2
4
6
8
10
12
14
16
0
1
2
3
4
5
6
7
8
9
10

FIG. 24

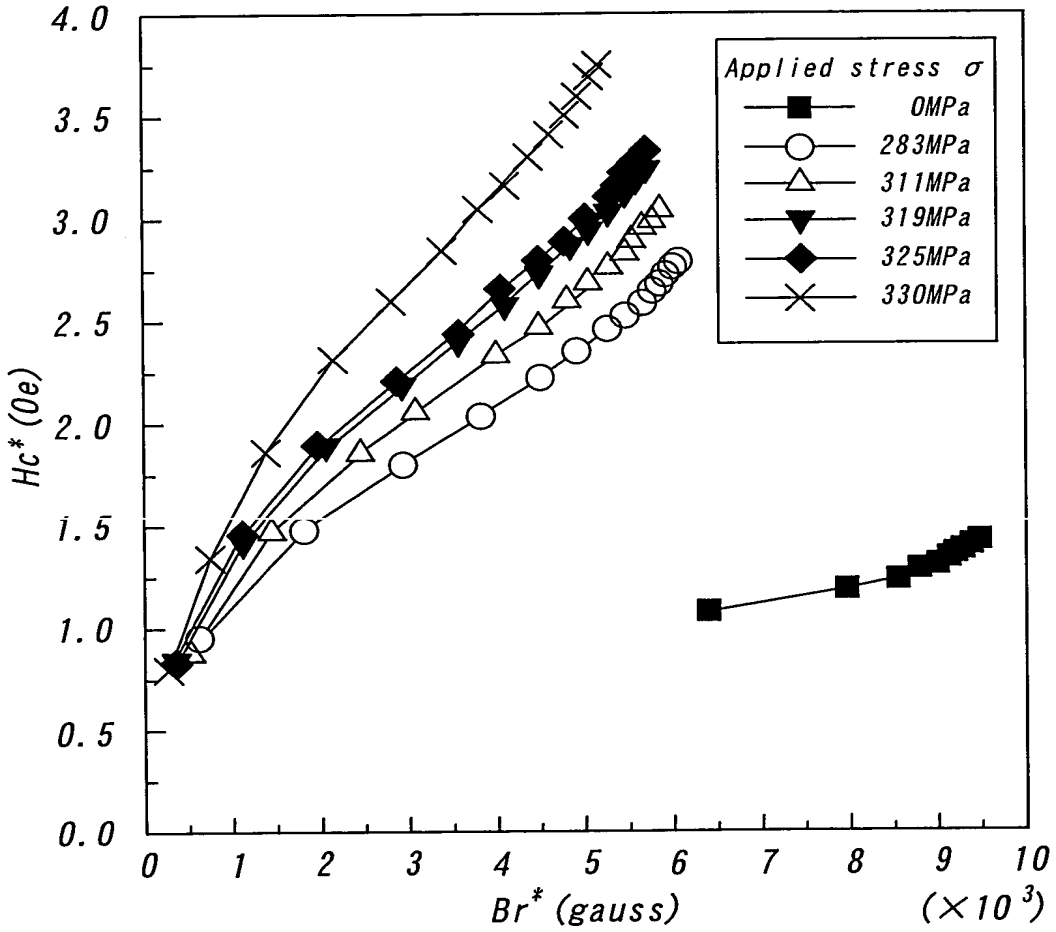

Applied stress σ
0MPa
283MPa
311MPa
319MPa
325MPa
330MPa
Hc* (Oe)
Br* (gauss)
(×10 3)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6
7
8
9
10

FIG. 25

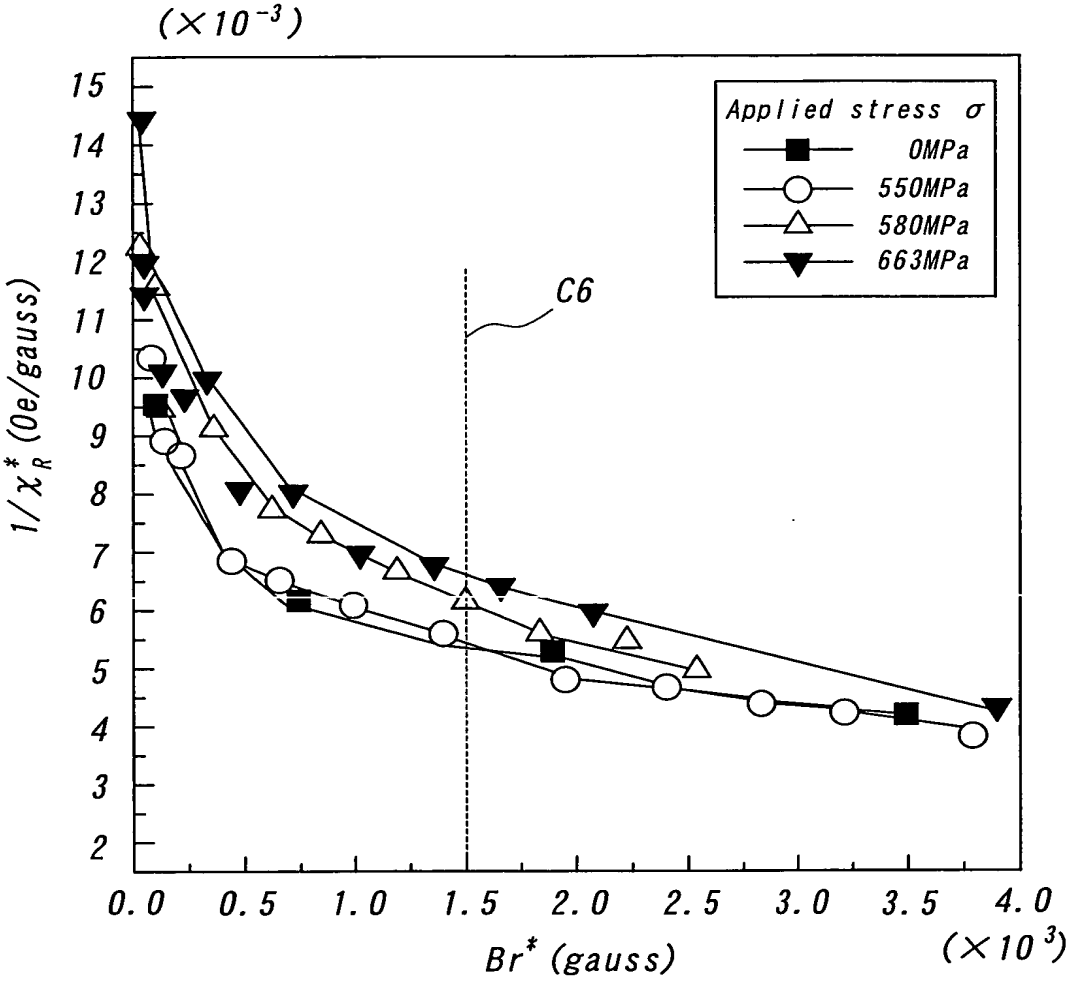

(×10⁻³)
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1/χ*R (Oe/gauss)
Applied stress σ
0MPa
550MPa
580MPa
663MPa
C6
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Br* (gauss)
(×10³)

FIG. 26

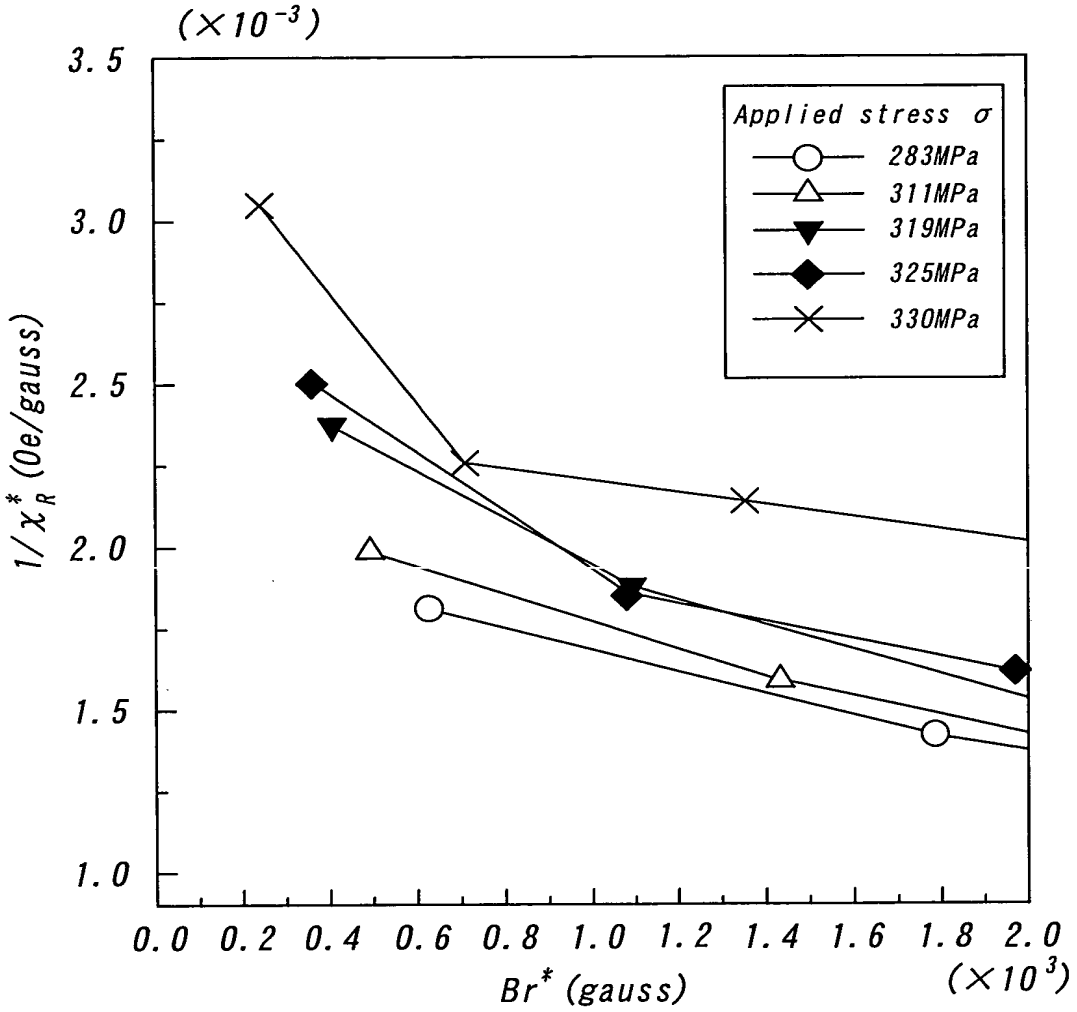

(×10⁻³)
3.5
3.0
2.5
2.0
1.5
1.0
1/χ*R (Oe/gauss)
Applied stress σ
283MPa
311MPa
319MPa
325MPa
330MPa
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0
(×10³)
Br* (gauss)

FIG. 27

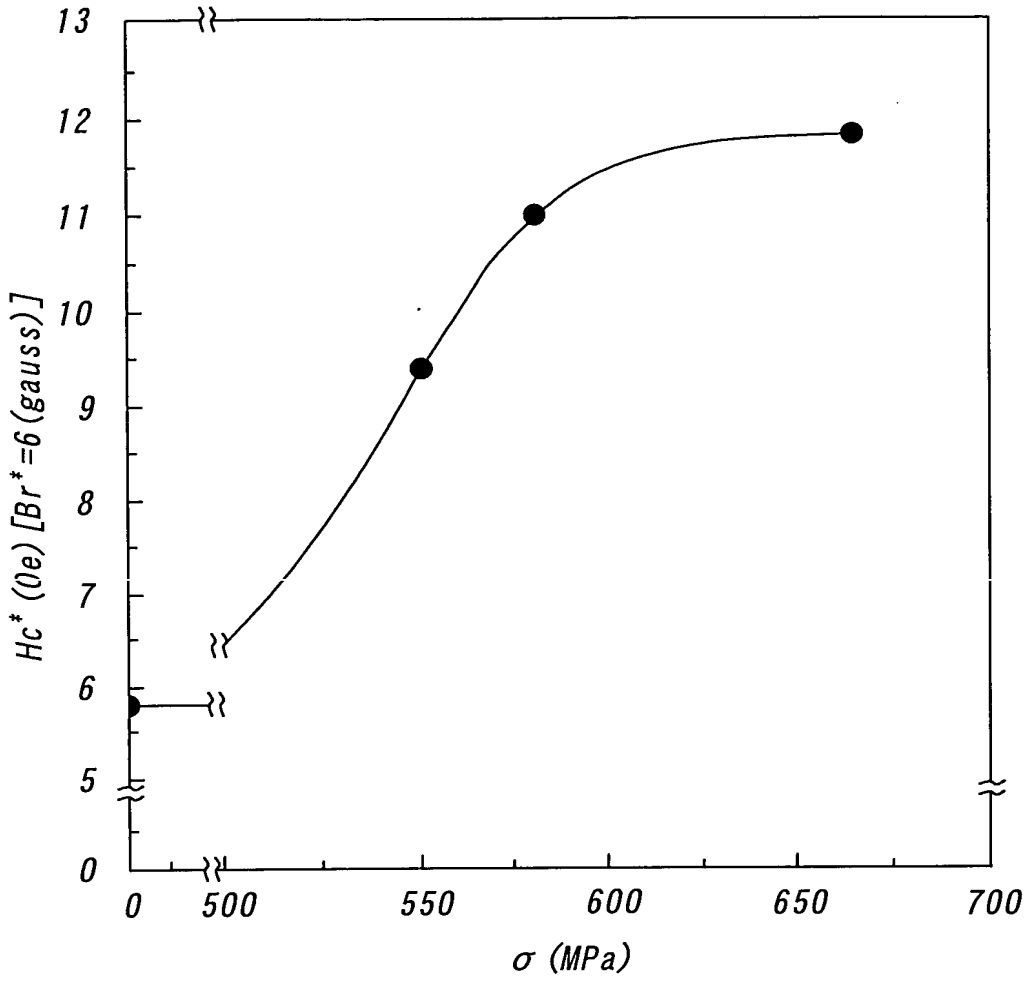


FIG. 28

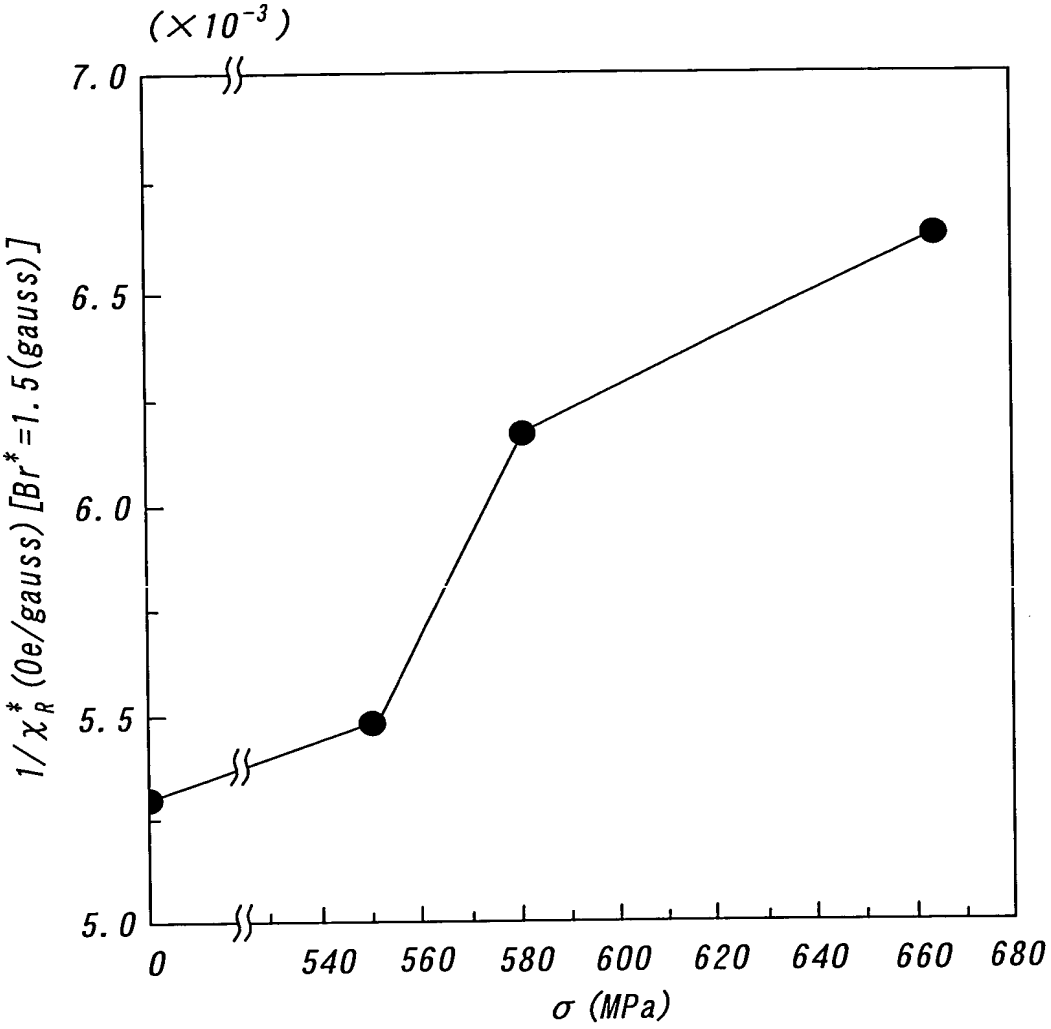

(×10⁻³)
7.0
6.5
6.0
5.5
5.0
1/χ*R (Oe/gauss) [Br*=1.5(gauss)]
0
540
560
580
600
620
640
660
680
σ (MPa)

FIG. 29

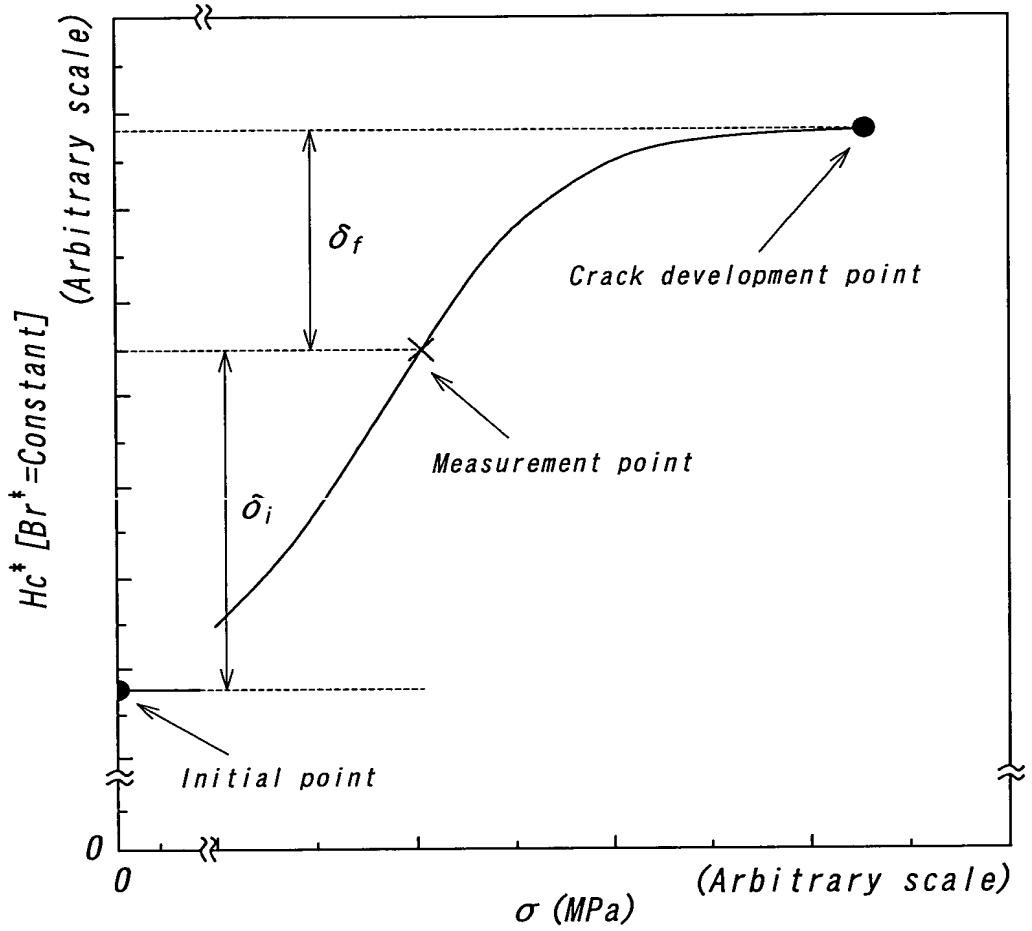

Hc* [Br*=Constant]
(Arbitrary scale)
δf
δi
Crack development point
Measurement point
Initial point
0
0
σ (MPa)
(Arbitrary scale)

FIG. 30

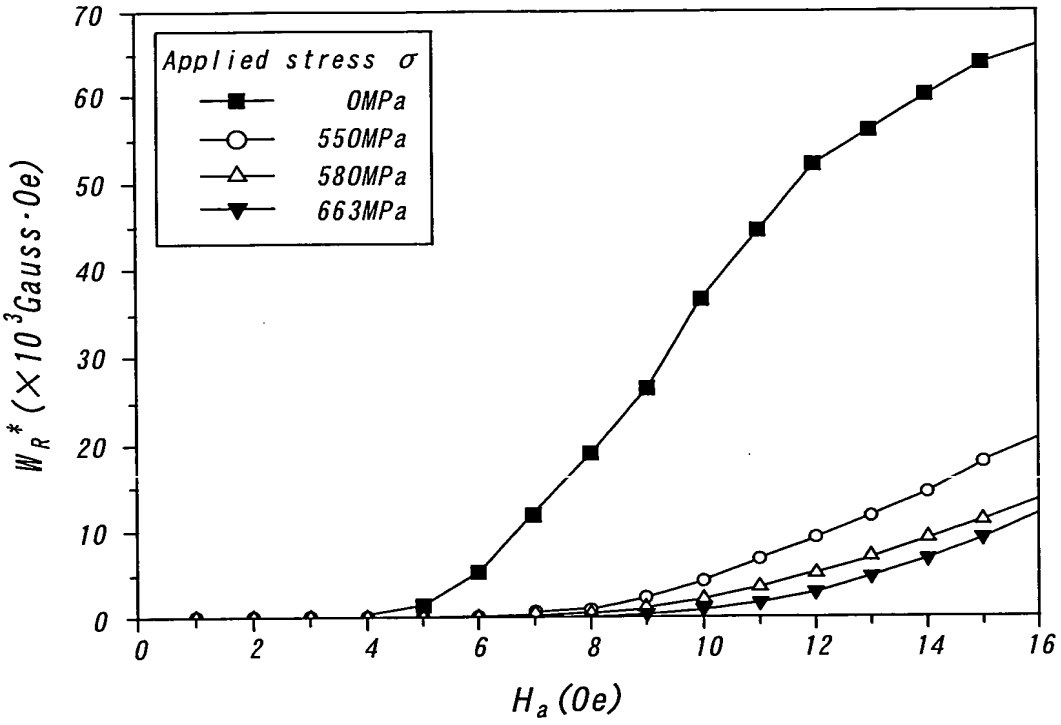

Applied stress σ
0MPa
550MPa
580MPa
663MPa
W_R^* (×10^{3}Gauss·Oe)
H_a (Oe)
0
10
20
30
40
50
60
70
0
2
4
6
8
10
12
14
16

FIG. 31

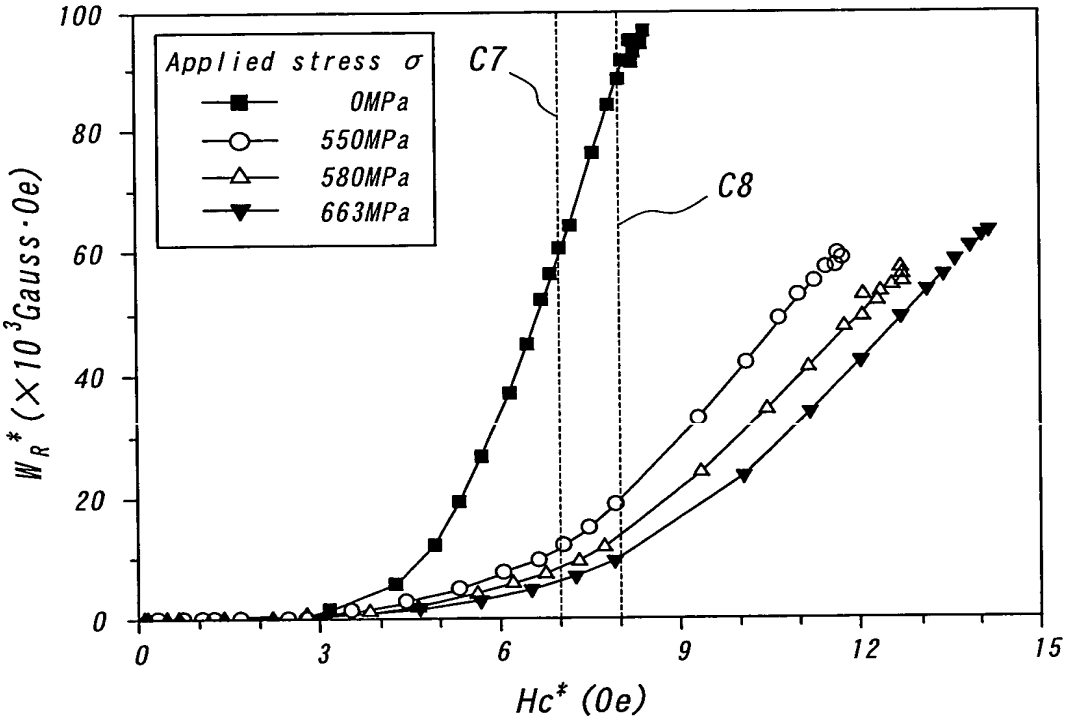

Applied stress σ
0MPa
550MPa
580MPa
663MPa
C7
C8
100
80
60
40
20
0
0
3
6
9
12
15
W_R^* (×10³Gauss·Oe)
Hc* (Oe)

FIG. 32

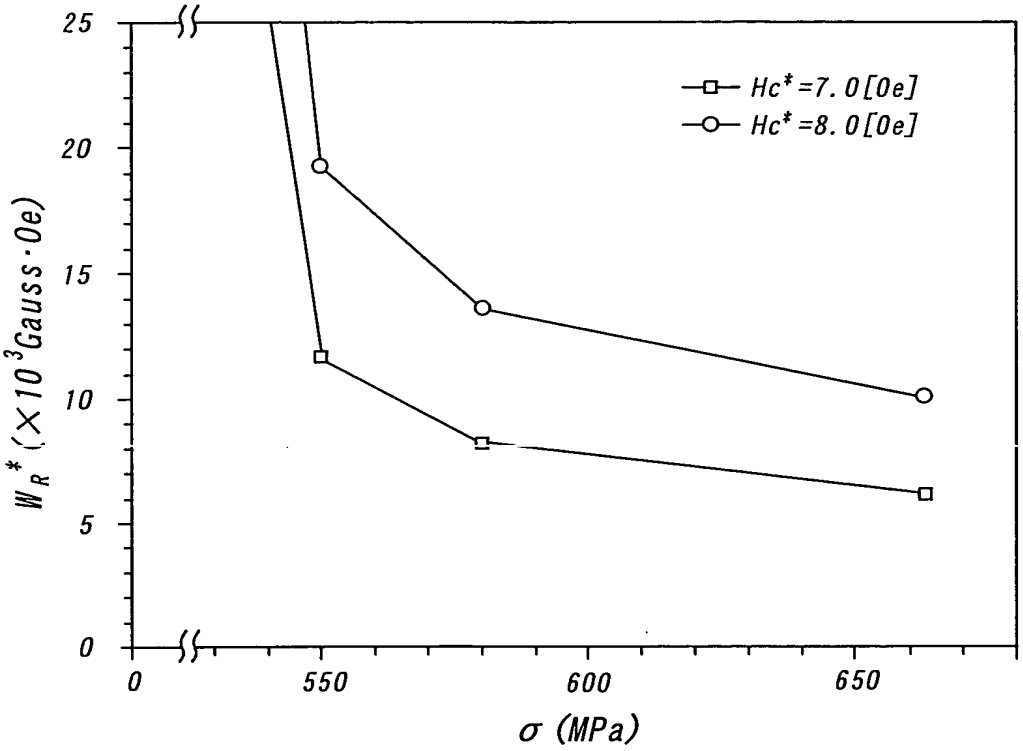


FIG. 33

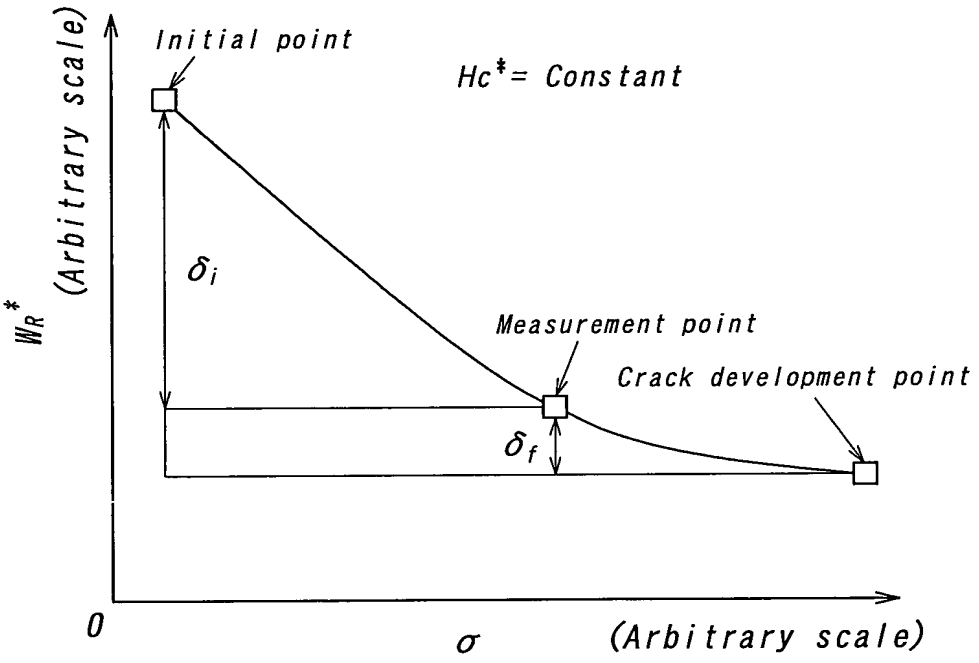

Initial point
Hc*= Constant
W_R^* (Arbitrary scale)
δ_i
Measurement point
Crack development point
δ_f
0
σ
(Arbitrary scale)

FIG. 34

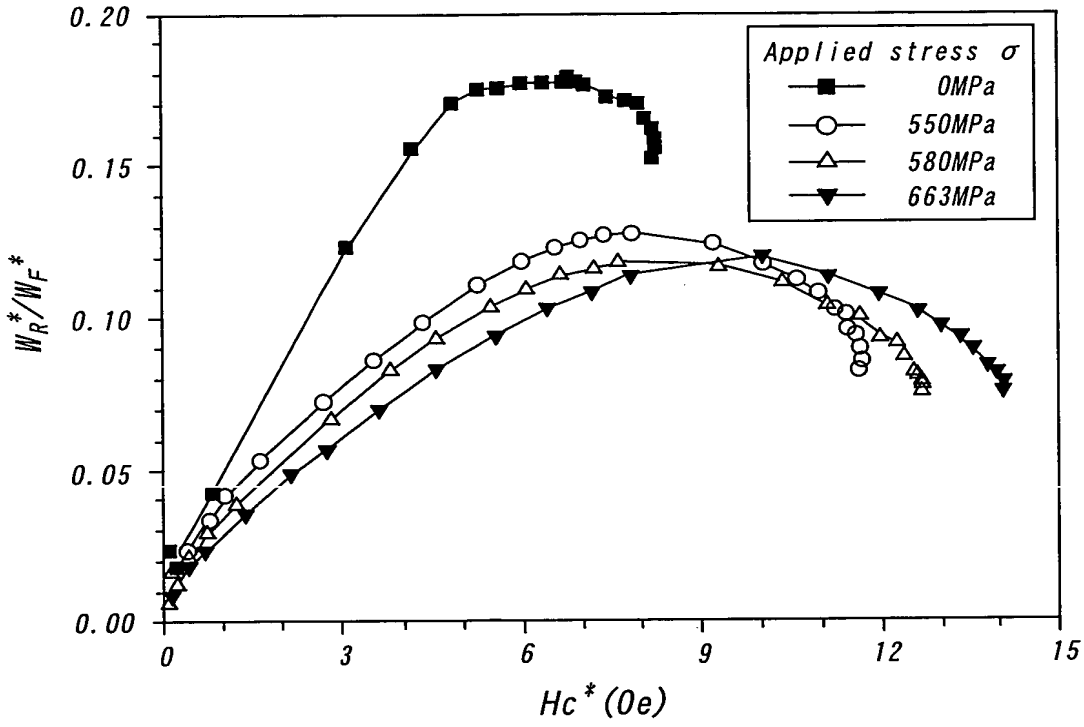

0.20
0.15
0.10
0.05
0.00
W_R^*/W_F^*
0
3
6
9
12
15
Hc* (Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 35

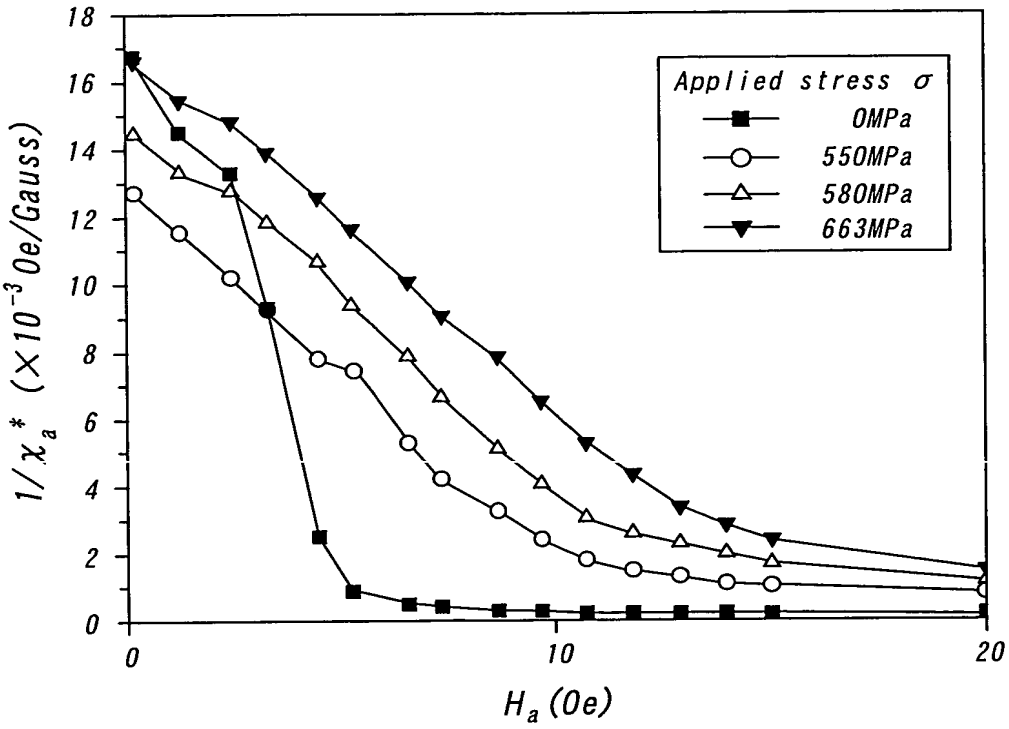

18
16
14
12
10
8
6
4
2
0
0
10
20
$1/\chi_a^*$ ($\times 10^{-3}$ Oe/Gauss)
H_a (Oe)
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 36

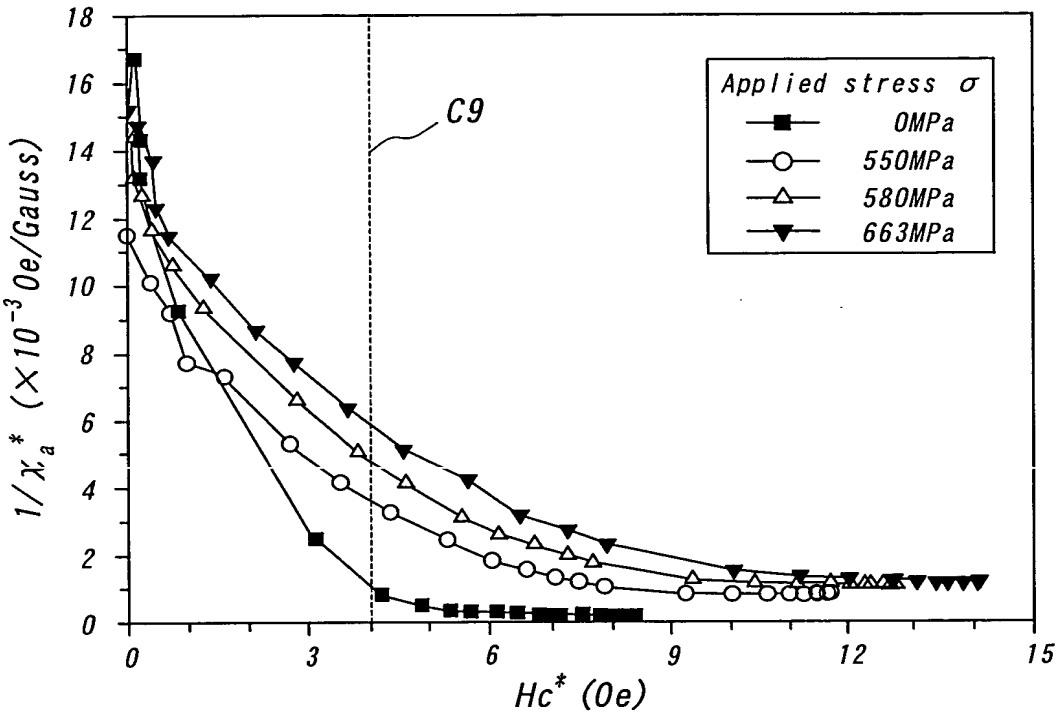

18
16
14
12
10
8
6
4
2
0
0
3
6
9
12
15
1/χa* (×10-3 Oe/Gauss)
Hc* (Oe)
C9
Applied stress σ
0MPa
550MPa
580MPa
663MPa

FIG. 37

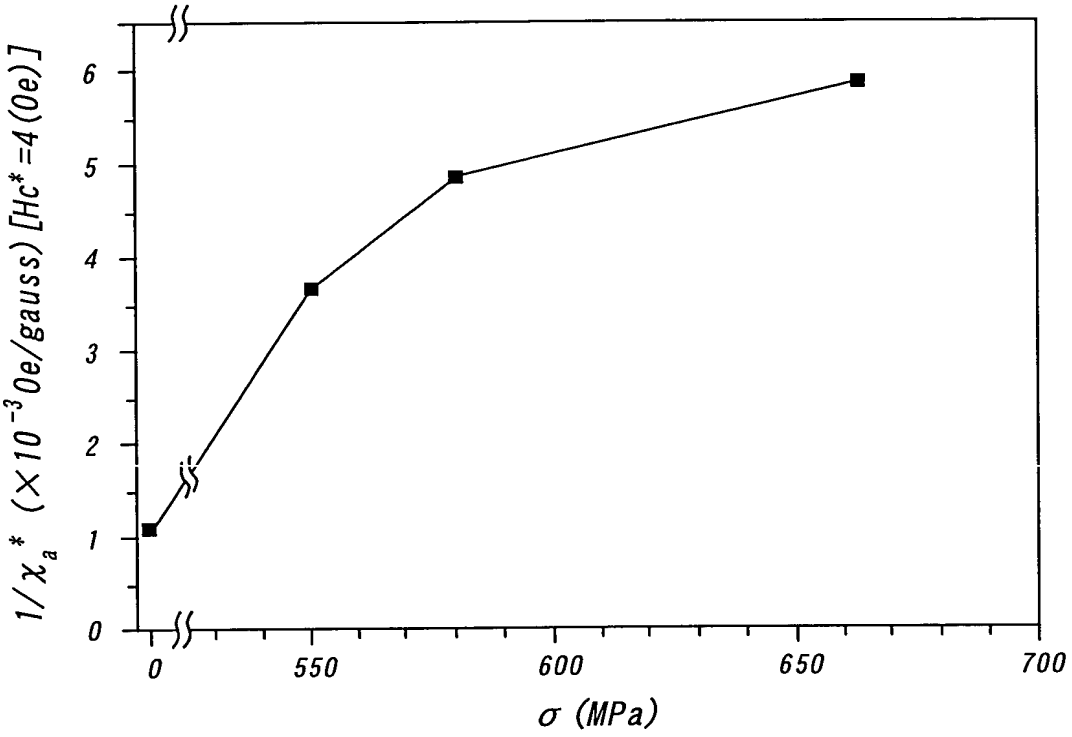


FIG. 38

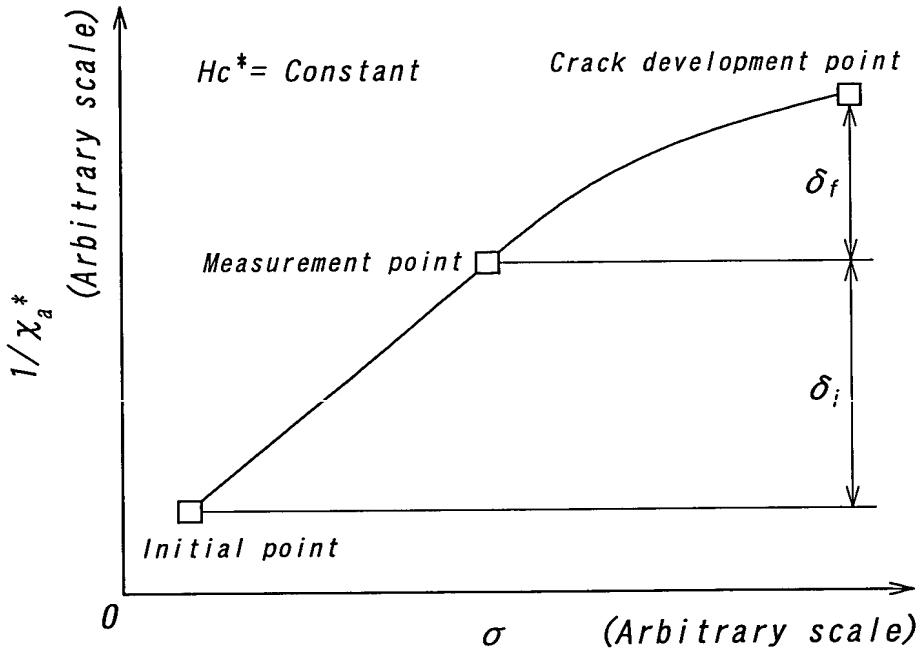

Hc*= Constant
Crack development point
δ_f
Measurement point
δ_i
Initial point
$1/\chi_a^*$
(Arbitrary scale)
0
σ
(Arbitrary scale)

FIG. 39

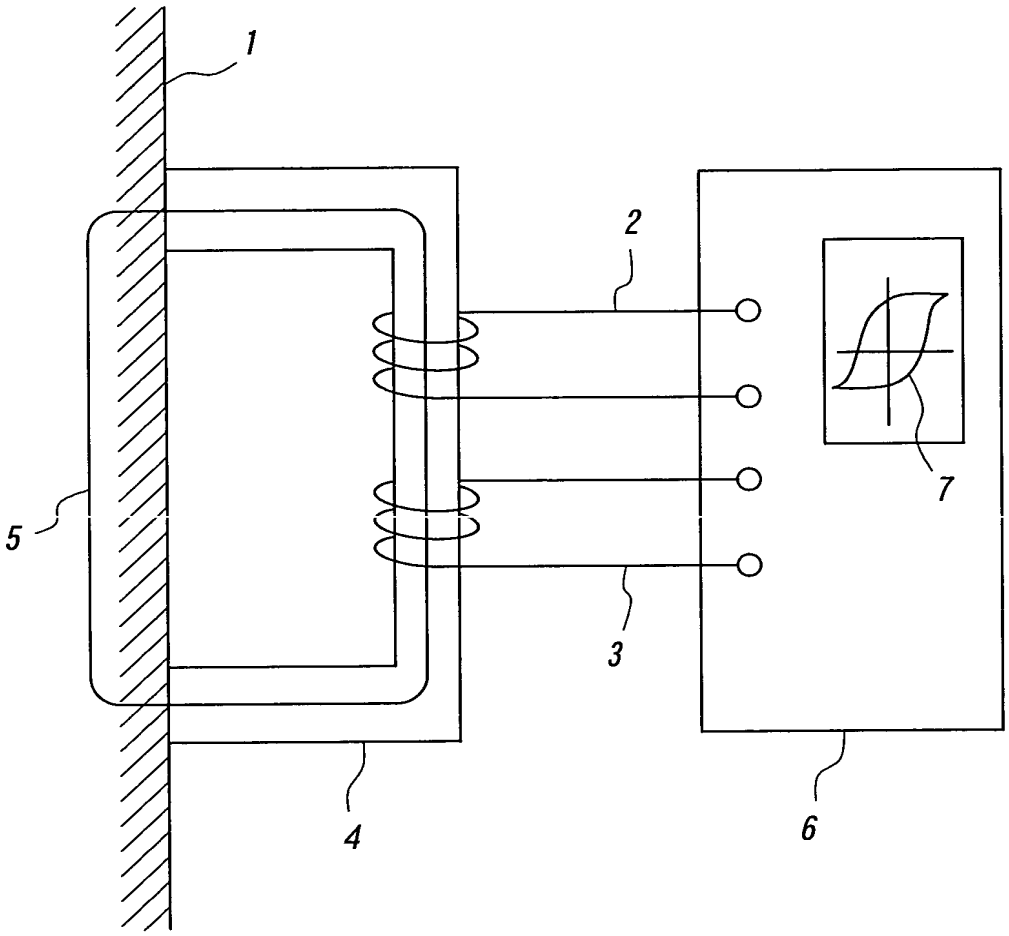


FIG. 40

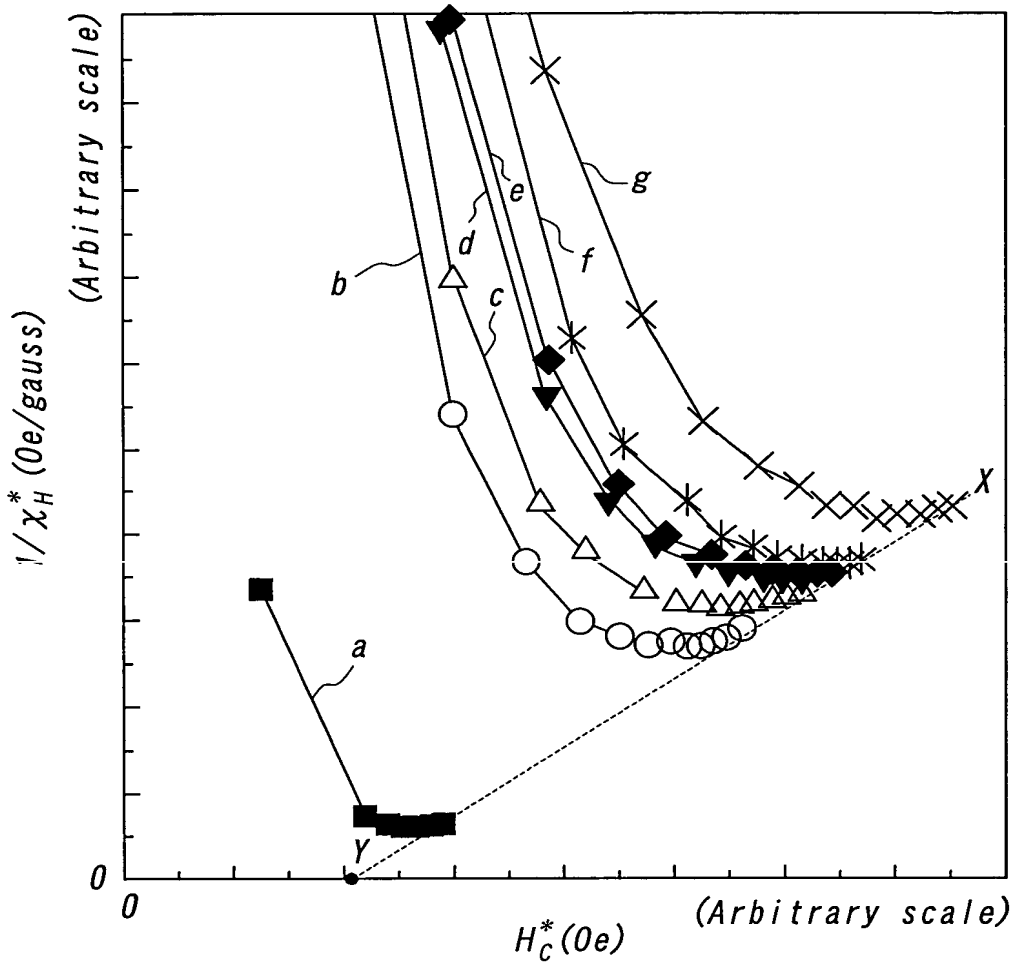
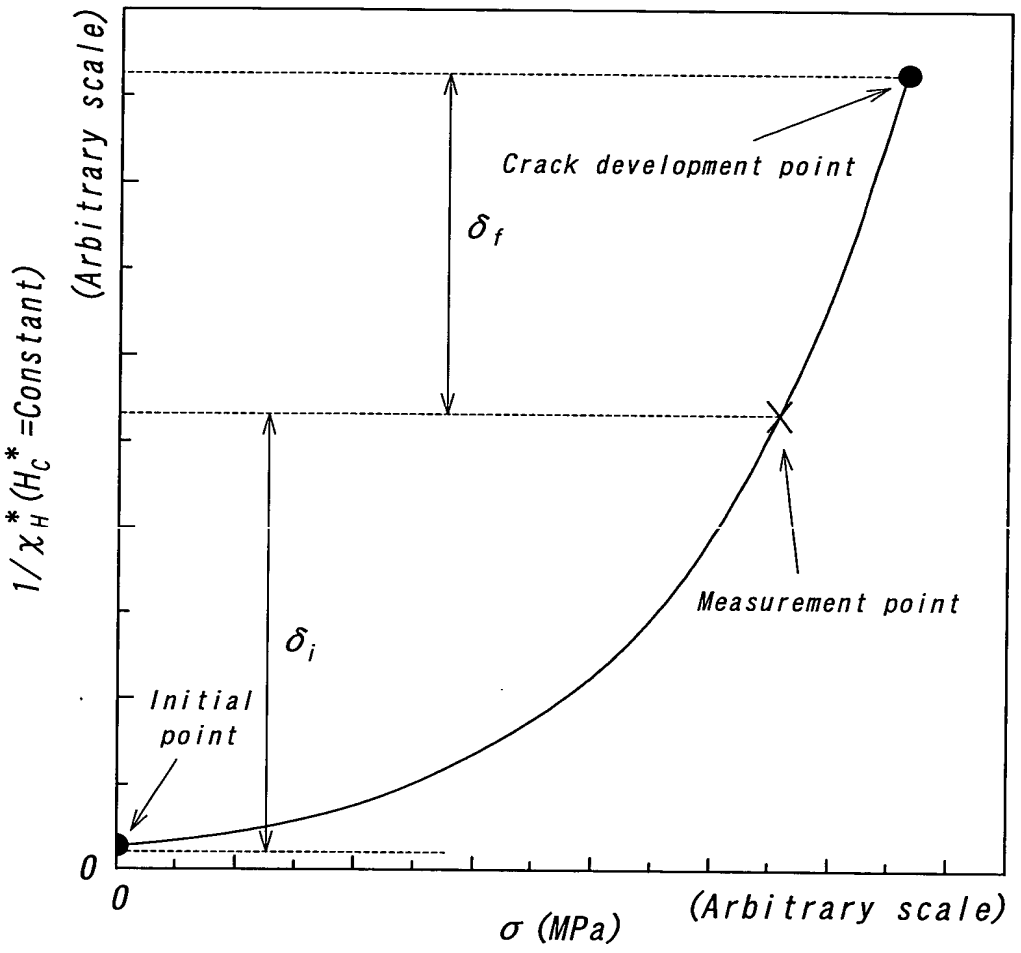

1/χ*H (Oe/gauss)
(Arbitrary scale)
a
b
c
d
e
f
g
X
Y
0
0
H*C (Oe)
(Arbitrary scale)

FIG. 41


1/χ*H (Hc*=Constant)
(Arbitrary scale)
Crack development point
δf
δi
Initial point
Measurement point
0
0
σ (MPa)
(Arbitrary scale)

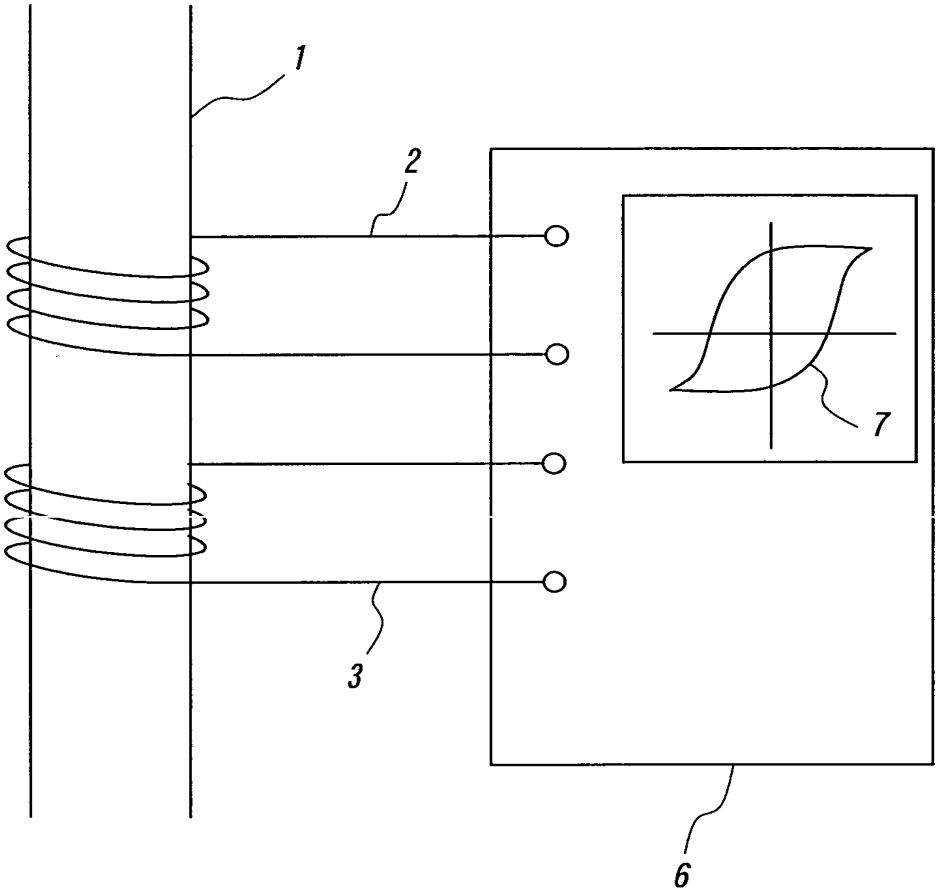



FIG. 42